The Fritzler Corn Maize | La Salle, Colorado | October 15, 2010

DigitalGlobe Systems and Products Overview

Joint Agency Commercial Imagery Evaluation (JACIE) 2011

March 30, 2011

Brett P. Thomassie - Director – Civil Government Programs

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DG Satellite Assets in the Sky

QuickBird

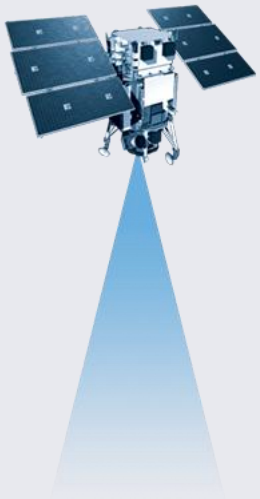
Launched Oct. 2001

First sub-meter commercial imaging satellite

WorldView-1

Launched Sept. 2007

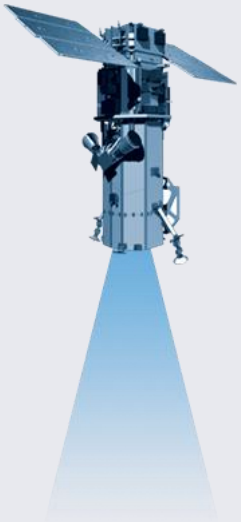
First agile commercial imaging satellite, 5X QB capacity



WorldView-2

Launched Oct. 2009

First 8-band commercial imaging satellite



WorldView-3

Expect Ready for Launch Late 2014

DG WorldWide Capacity & Content Leadership

Capacity & Content

Constellation/Platforms	ImageLibrary*
2-3x more high-res collection capacity	1.5 billion km2 high-res data
Shorter revisit time (1.1 days)	33% less than one year old
8-bands	30cm Advanced Ortho Aerial Series (AOAP)
3 Current Sats + WV3 (2014 Launch)	Offline and Online (DG Cloud Services) Delivery
AOAP	

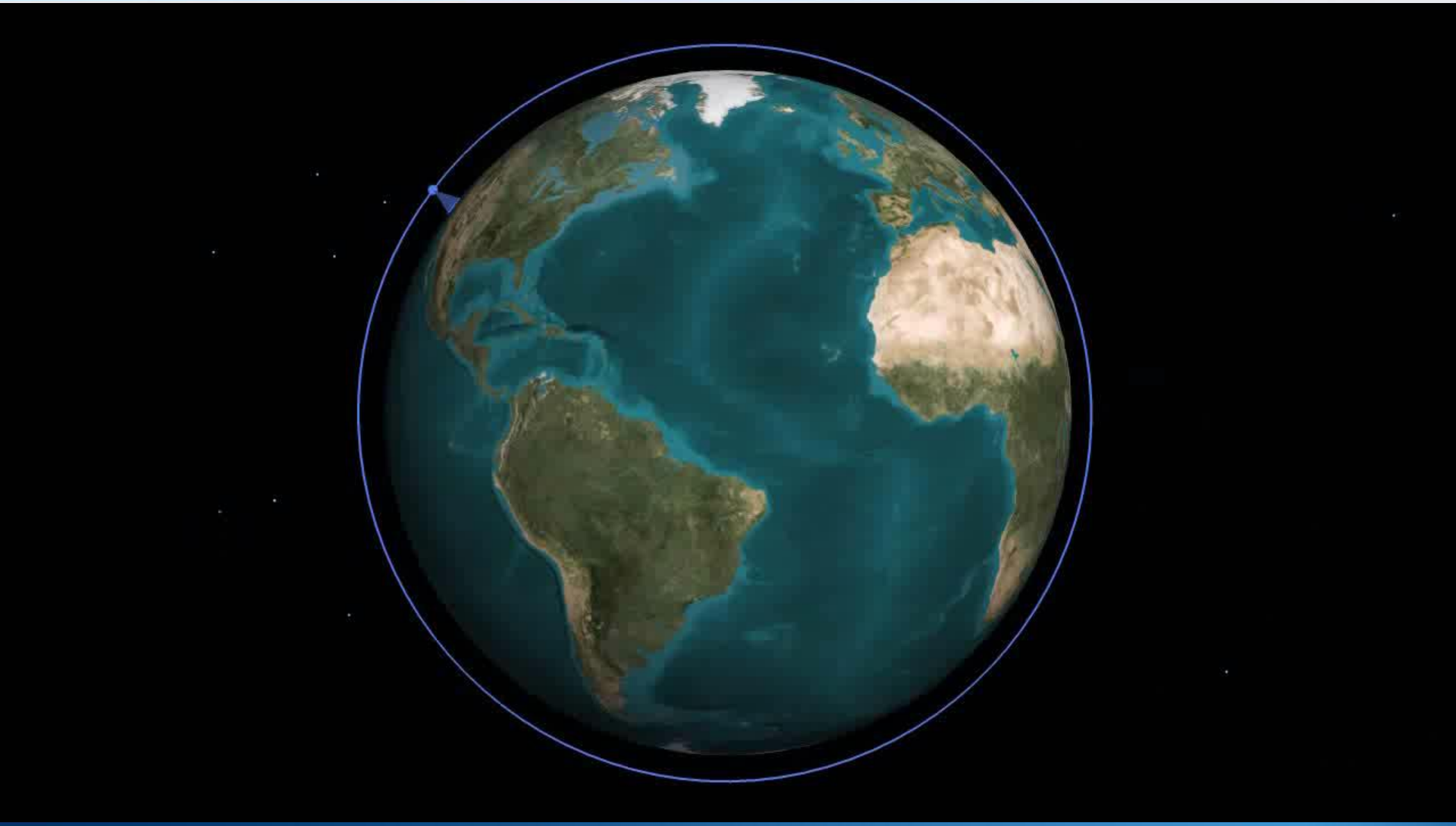
DigitalGlobe has the largest, most advanced, commercial sub-meter satellite **constellation and Image Library** in the world.

And we'll maintain this leadership position in the years to come.

DigitalGlobe leads industry in capacity and content.

*As of January 5, 2011

Our DG Satellites Have Global Coverage



Our Satellites Image by Scanning the Ground

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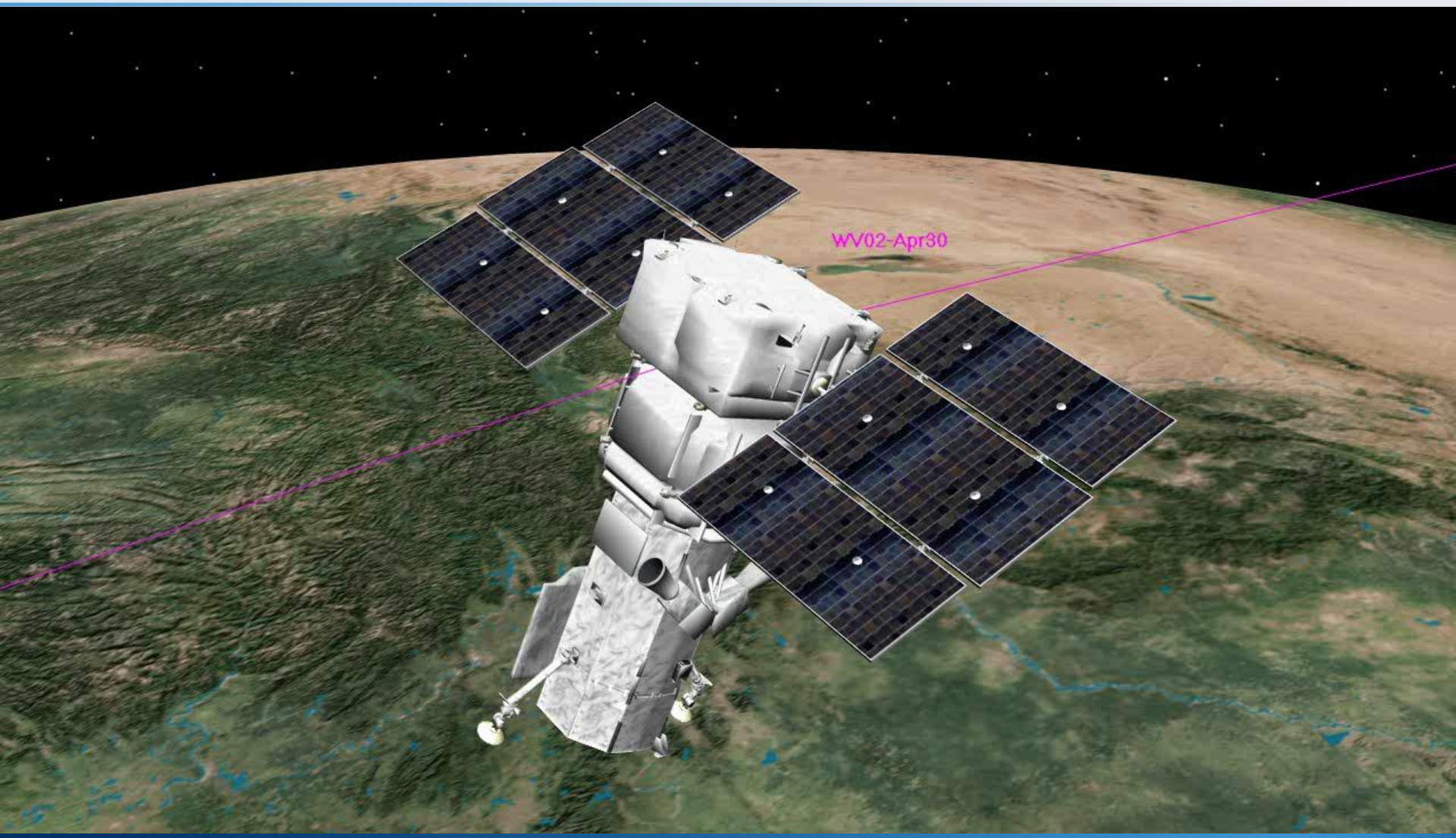
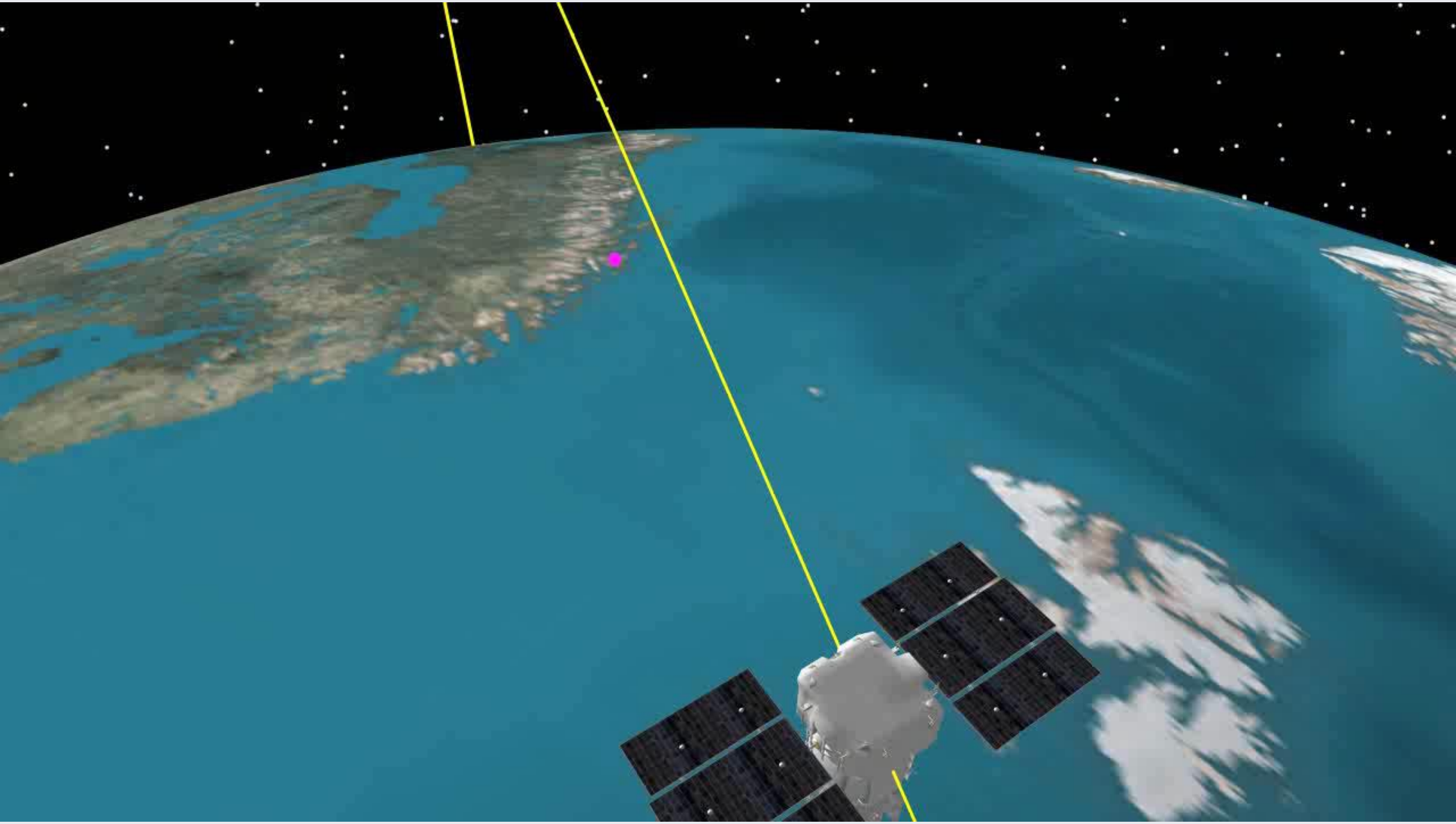
DigitalGlobe Plans Where Each Satellite Looks

...Due to Limited Satellite Agility (Reaction Wheel)

...Due to Much More Agile CMG Technology



DG Ground Stations Downlink Captured Satellite Imagery



DigitalGlobe Advanced Constellation

Faster

- Annual collection rate: equal to 3X the world's land mass
- More daily collection: over 1.5 million km² / day
- More total ImageLibrary: over 1.5 Billion km²

Better

- Provides Large area collection with fewer attempts and consistent radiometry
- Better multispectral data: Unique 8-band WorldView-2 data

WV2 Mono Collection Capabilities

Better Means…

1.In predominately cloudy areas like Alaska and Jakarta, Indonesia (annual avg cloud cover 63%) we will maximize collects on cloud free days

2. Improved collection timeframes

3.Improved radiometry across orthomosaics and reduced issues associated with multiple day collects

Large Area Collection Capabilities:

WV-2 has the agility to collect an area up to **15,600 km² in a single pass**

based on 30º off nadir

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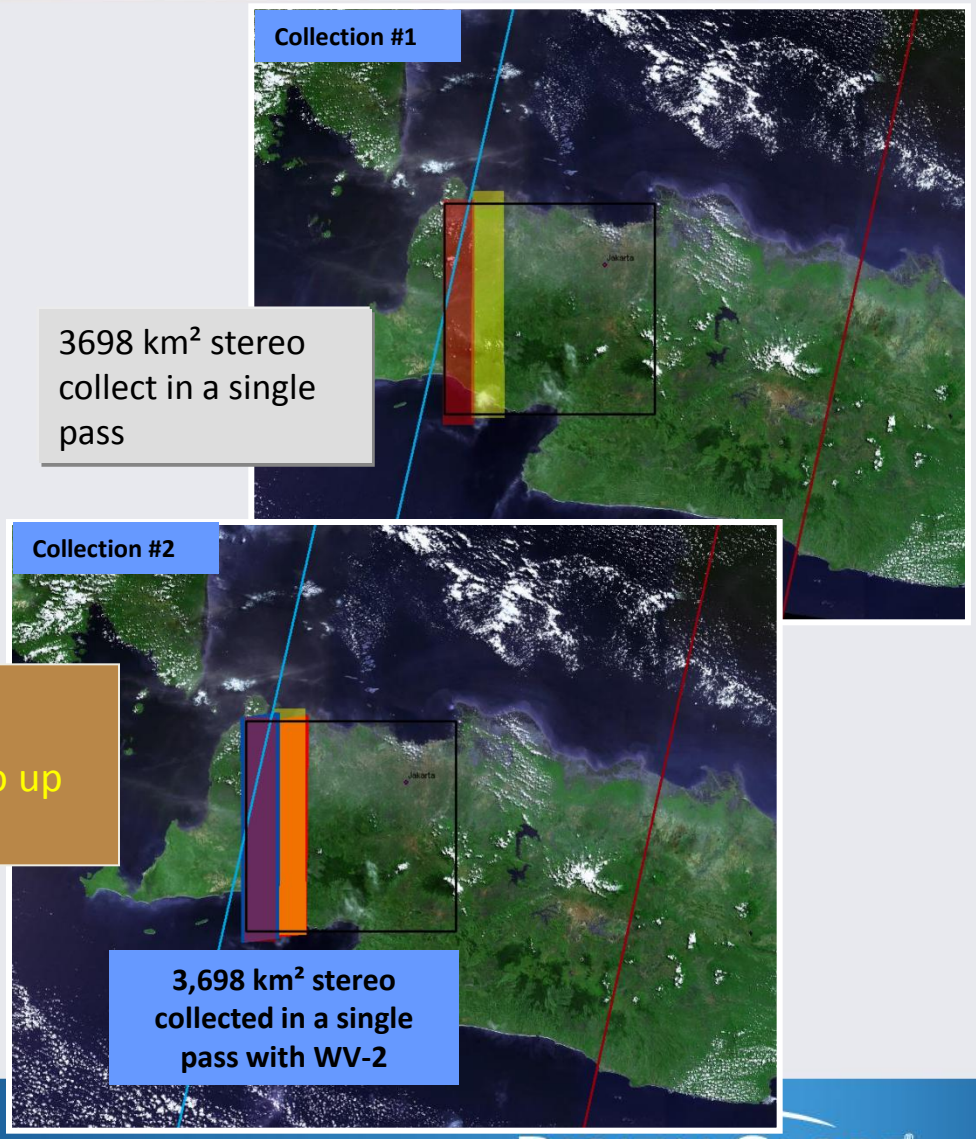
WV2 Stereo Collection Capabilities

Better Means…

1. Ability to have large areas collected in multispectral stereo faster
2. Shorter collection windows
3. Regional stereo availability (e.g. Provinces, States, Country)

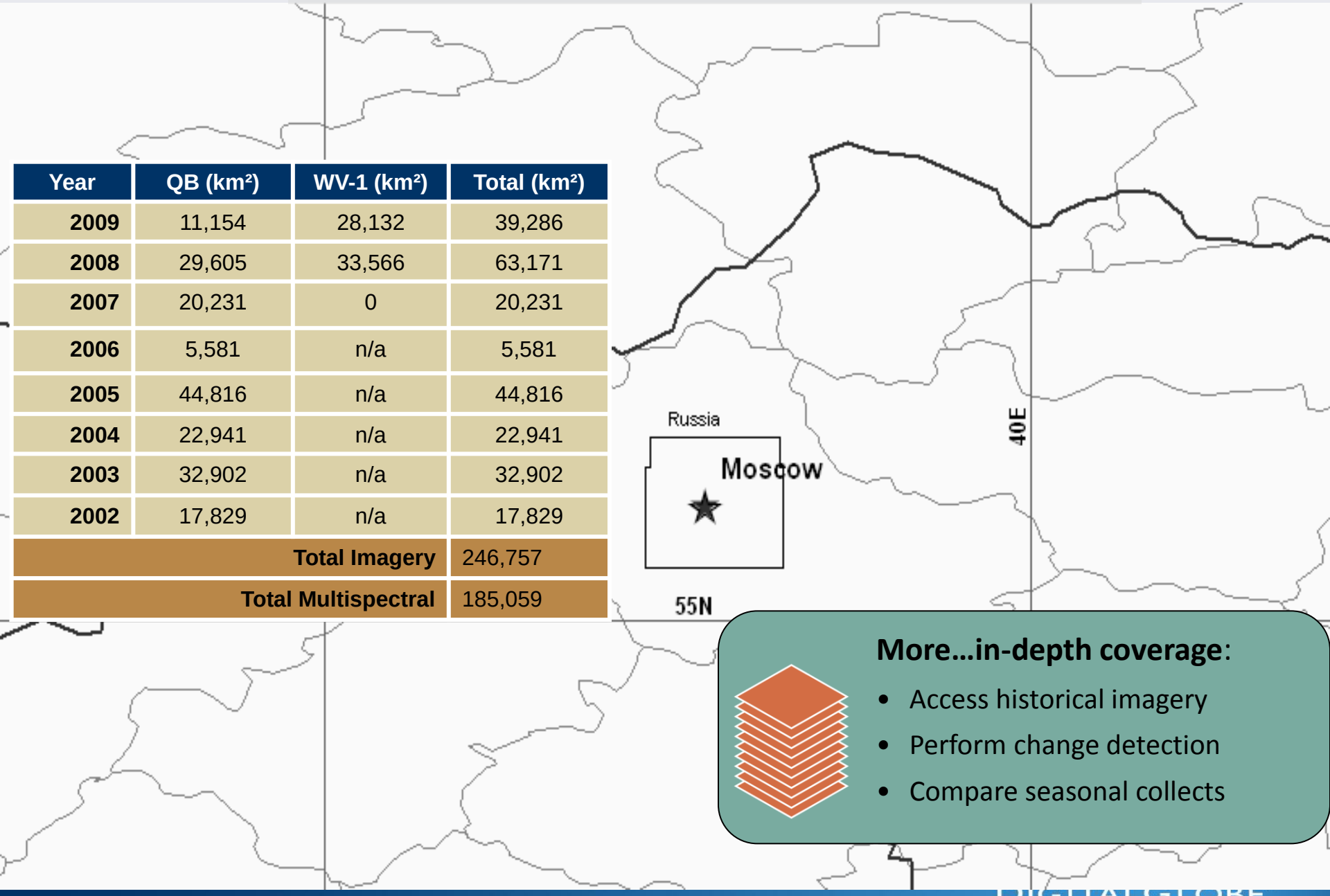


Large Stereo Collection Capabilities:

WV-2 has the agility to collect an area in stereo up to 6950km² in multispectral in a single pass

Moscow: Latitude: 55º 45'N

Year	QB (km²)	WV-1 (km²)	Total (km²)
2009	11,154	28,132	39,286
2008	29,605	33,566	63,171
2007	20,231	0	20,231
2006	5,581	n/a	5,581
2005	44,816	n/a	44,816
2004	22,941	n/a	22,941
2003	32,902	n/a	32,902
2002	17,829	n/a	17,829
		Total Imagery	246,757
		Total Multispectral	185,059



More…in-depth coverage:

- Access historical imagery
- Perform change detection
- Compare seasonal collects

More Accesses with Three Operational Satellites, Faster Refresh

More…Accesses

42 total accesses
(QB+WV-1+WV-2)

QB Accesses
11 Total

QB +WV-1 Accesses
23 Total

November 2009

1 QB	2 WV-1 WV-2	3 WV-1 WV-2	4 QB	5 WV-2	6 QB WV-2	7 WV-1
8 WV-2	9 QB	10 WV-2	11 QB WV-1 WV-2	12 WV-1	13 WV-2	14 QB WV-2
15 WV-1	16 WV-1 WV-2	17 WV-2	18	19 QB WV-1 WV-2	20 WV-1	21 WV-2
22 QB WV-2	23	24 QB WV-1 WV-2	25 WV-2	26	27 QB WV-2	28 WV-1 WV-2
29 QB WV-1	30 WV-2					

Results based on 30º off nadir

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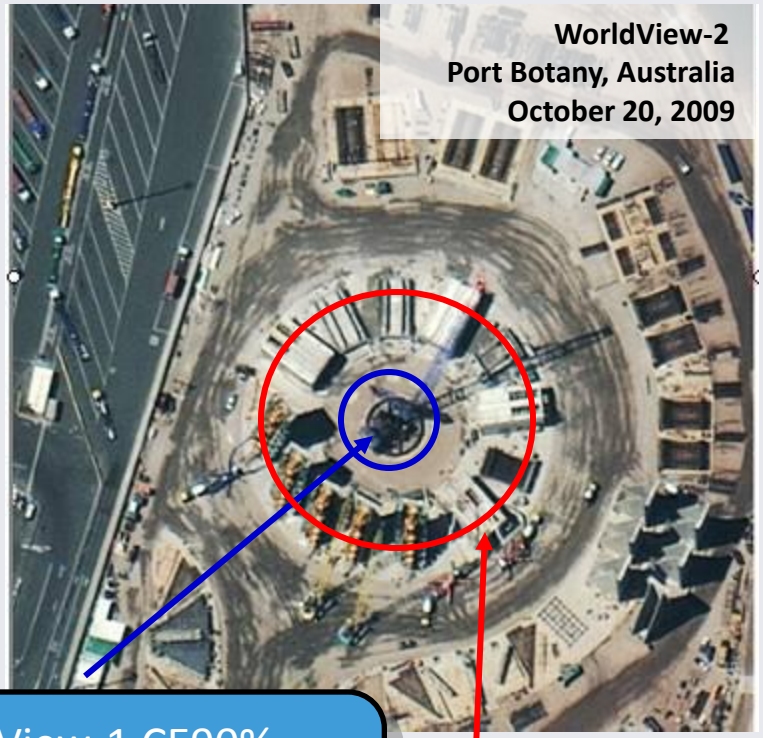
DG Constellation Resolution and Accuracy

- WorldView-2 has 50 cm resolution and comparable accuracy standards to WorldView-1
  - WorldView-1stand-alone accuracy certified at 4.1 m CE90% or better without ground control at NADIR*
  - The combination of WV02's refined attitude, restricting the off nadir angle (ONA) to 20 degrees and measuring accuracy in areas with a slope less than 5 degrees we can meet 1:12,000 ortho accuracy in remote areas without ground control (e.g., Yukon Flats, AK)



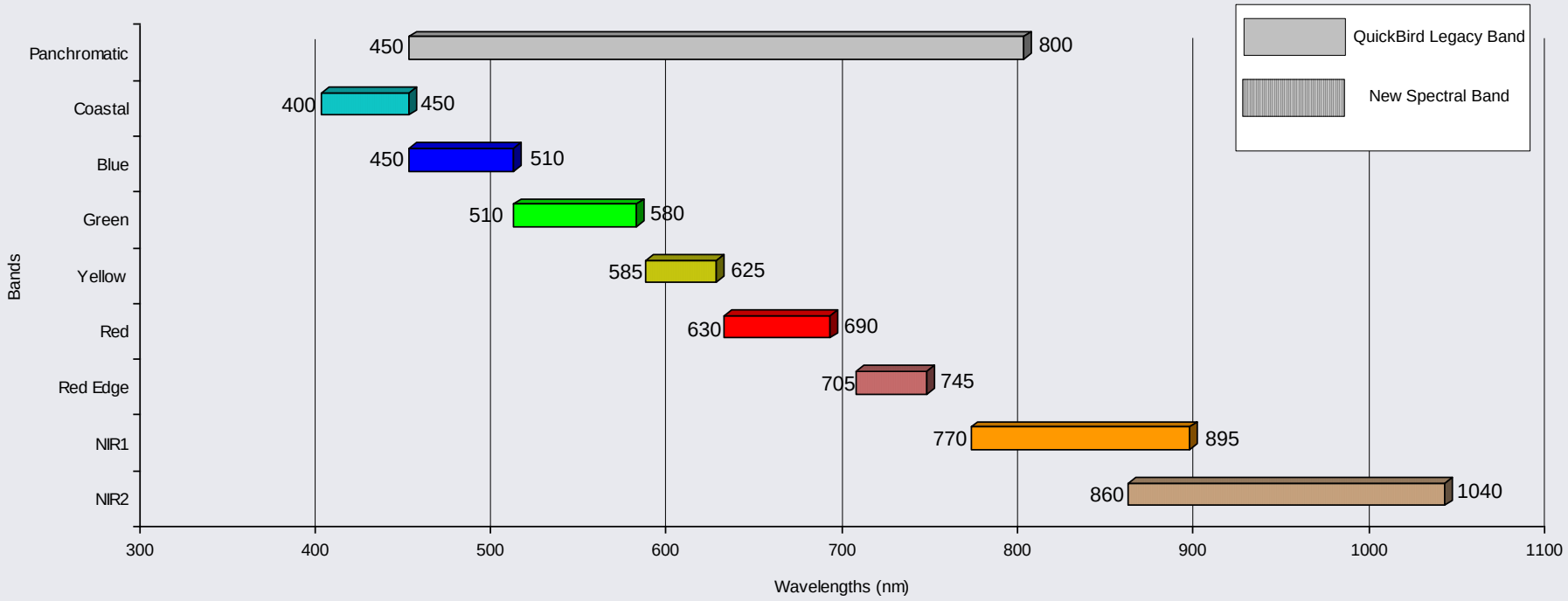
* Excludes terrain displacement and viewing angle distortion

WorldView-2

4/8/2011 16

WorldView-2

Higher Spatial and Spectral Resolution!



- WorldView-2 has a narrow 50cm “visible” pan band – increases contrast between soil and veg
- 8 MS Bands @ 1.8m native resolution – to support more “spectral” or analytical applications
- WorldView-2 satellite incorporates the industry standard four multispectral bands
  -- Red, Blue, Green, Near-Infrared
- Adds Four (4) additional (NEW) bands -- Coastal Blue, Yellow, Red Edge, Longer Wave NIR2

WorldView-2 Traditional Spectral Bands

- **Blue (0.45 - 0.51 µm)**
  - Designed for water body penetration, making it useful for coastal water mapping. Also, useful for soil/vegetation discrimination, forest type mapping and cultural feature identification.
- **Green (0.51 -0.58 µm)**
  - Useful for measuring green reflectance of vegetation. It can also be used for cultural feature identification.
- **Red (0.63 -0.69 µm)**
  - Sensitive to chlorophyll absorption region. It is useful for vegetation analysis and can even be used to differentiate plant types. It is also useful for cultural feature identification.
- **Near Infrared (NIR1) (0.77 -0.895 µm)**
  - This band is useful for determining vegetation types, vigor and biomass survey, delineating water bodies, and for soil moisture discrimination.

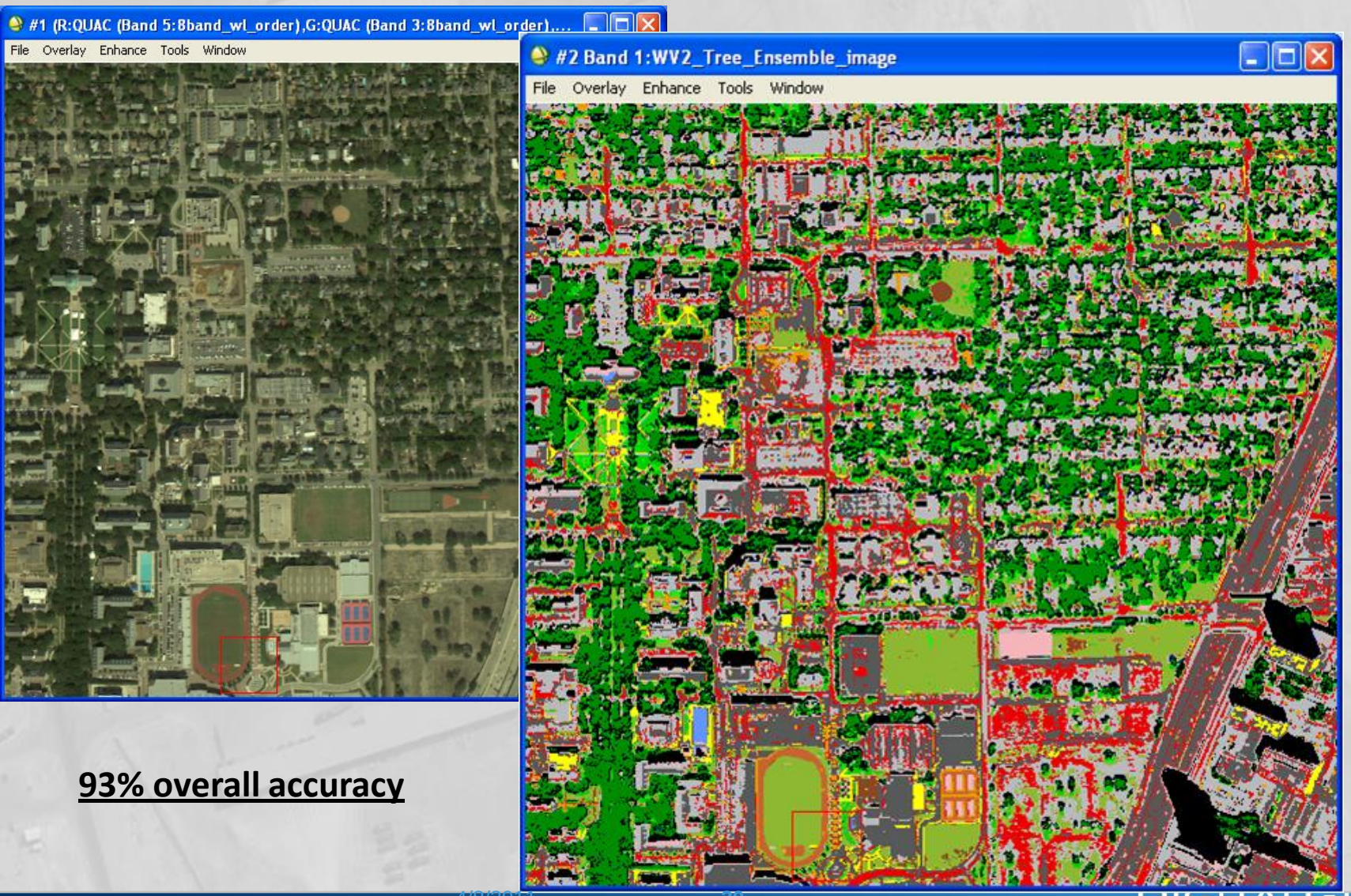
New WorldView-2 Spectral Bands

- **Coastal band**
  - Will support coastline water depth studies based upon its chlorophyll and water penetration characteristics
  - Vegetation identification and analysis based on chlorophyll and water penetration characteristics
  - Subject to atmospheric scattering; will be investigated to examine atmospheric correction techniques
- **Yellow**
  - Ability to reproduce true color
  - Helpful for vegetation and turbidity analysis
- **Red Edge**
  - Vegetative analysis; directly related to plant health revealed through chlorophyll production
- **NIR2**
  - Spectral analysis; overlaps with NIR-1 but less affected by atmospheric influence; may assist in atmospheric correction
  - Supports vegetative analysis and biomass studies

Bands	Lower Band Edge (nm)	Upper Band Edge (nm)
Pan	450	800
Coastal	**400**	**450**
Blue	450	510
Green	510	580
Yellow	**585**	**625**
Red	630	690
Red Edge	**705**	**745**
NIR1	770	898
NIR2	**860**	**1040**

WV2's 8-Bands Provides Improved High-Res Classifications

Tree Ensemble Classification Approach
15 Land Cover Types (DALLAS, TX)

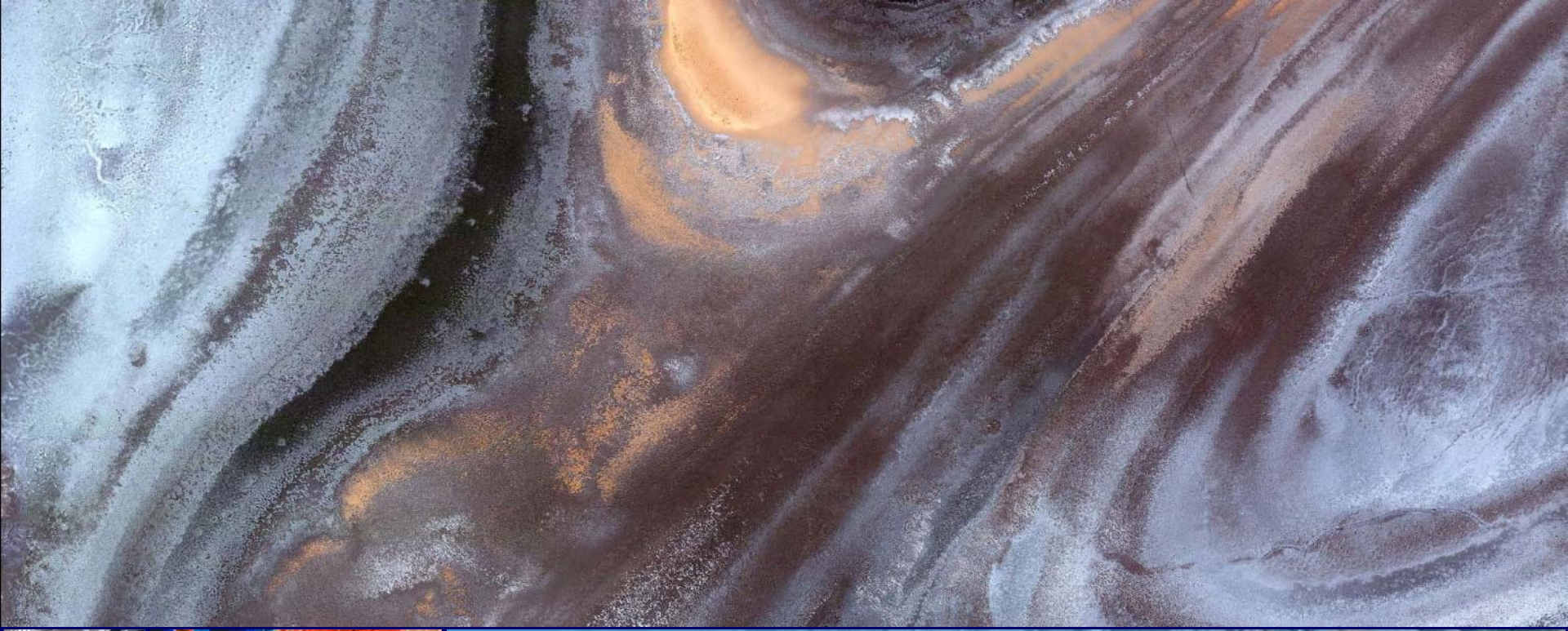


93% overall accuracy

2011 DigitalGlobe - IEEE GRSS Data Fusion Contest

This year, the DG Data Fusion Contest aims at exploiting multi-angular acquisitions over the same target area.

http://dgl.us.neolane.net/res/dgl/survey/IEEE_DigitalGlobe.jsp



DigitalGlobe's Analysis Center

February, 2011

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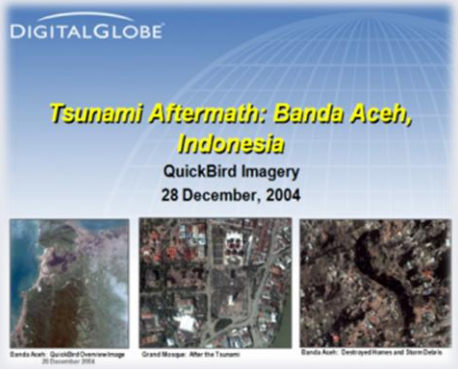
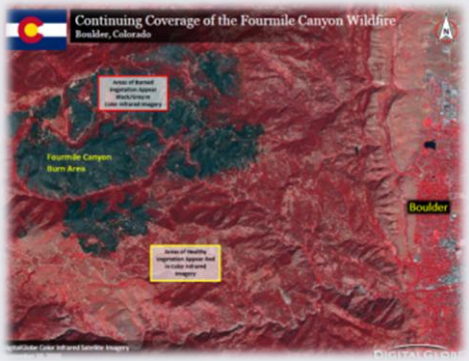
"The ultimate value of satellite data comes from integration with other technologies of the information age. <u>Satellite data becomes much more useful after it has been analyzed and fused with other geospatial technologies…"</u>[1]





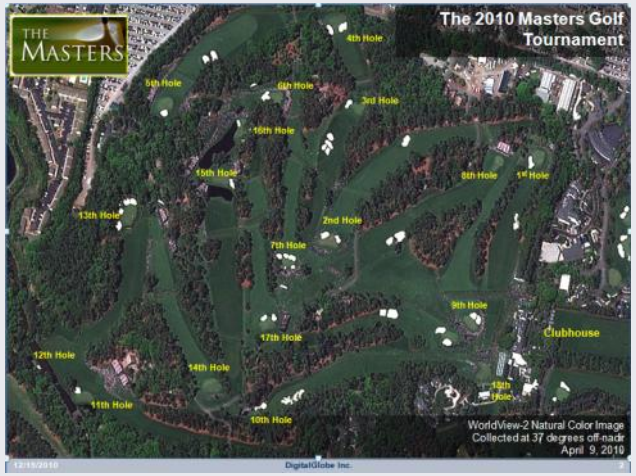
[1] *David B. Sandalow; Assistant Secretary for Oceans and International Environmental and Scientific Affairs; June 6, 2000*

DGAC Markets & Customers

- The DG Analysis Center will provide value-added imagery products and services to new and existing commercial and government agency customers
  - Imagery and geospatial analysis, which will enable information and insight, will serve all of our core customer domains

US & Intl Civil Govt

Consumer

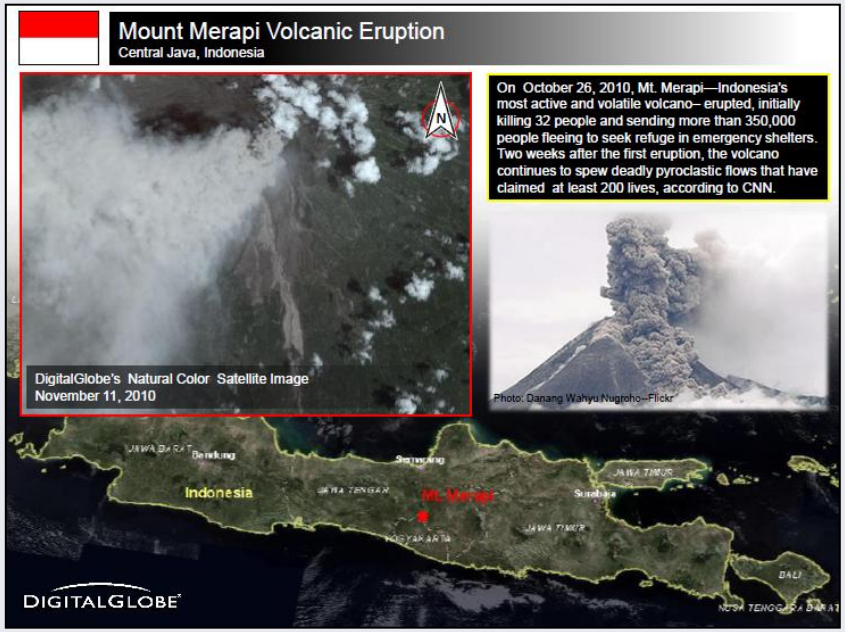


US & Intl Defense & Intelligence

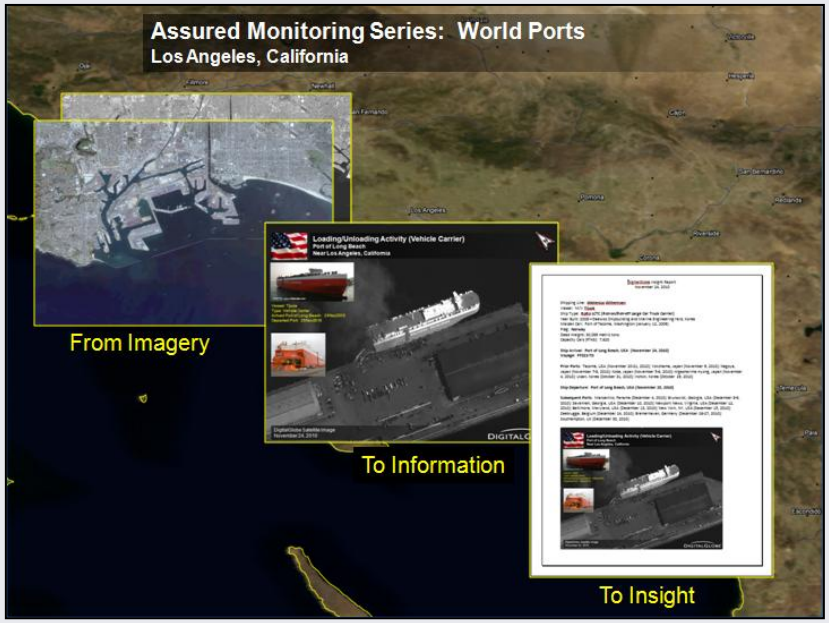
DGAC 2011 **Products** and Services

- Initially Focused on Two Products from DG Monitoring Series:
  - Q1: FirstWatch (Analysis + FirstLook/Crisis Event Service)
  - Q2: AssuredWatch (Analysis + AssuredLook Monitoring Program)

FirstWatch



AssuredWatch

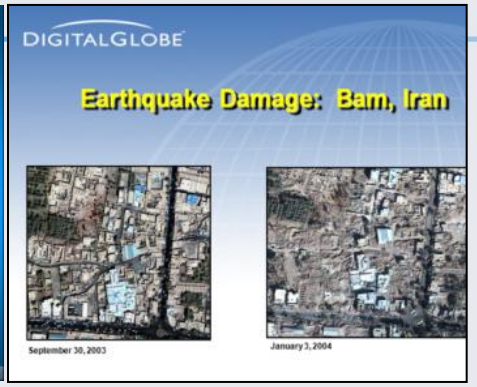


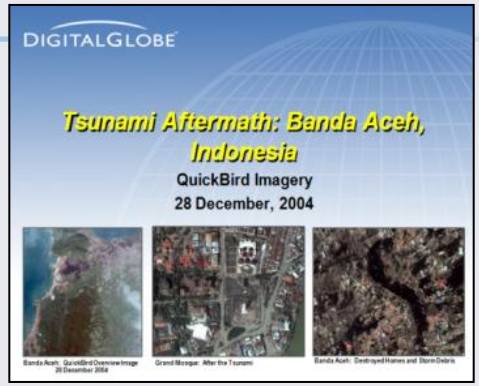
Fukushima Daiichi Nuclear Power Plant – Japan – March 14, 2011

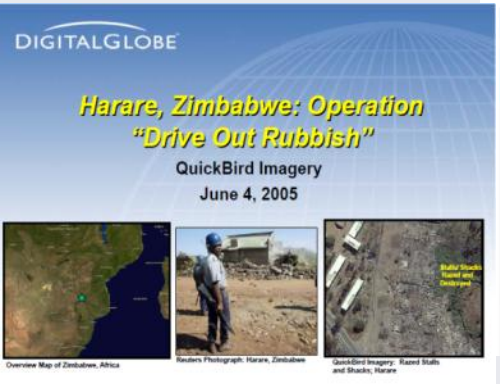
DigitalGlobe Monitoring Series

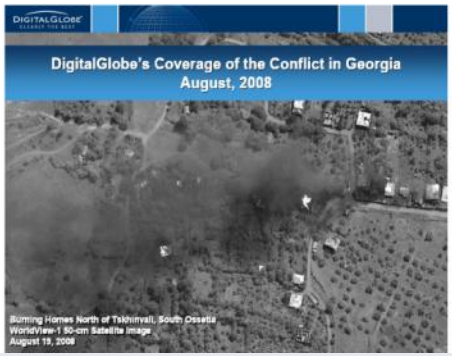
DIGITALGLOBE®

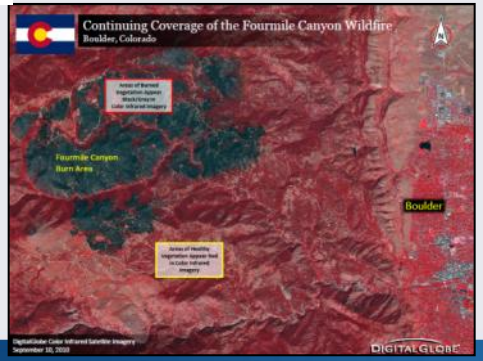
Responding to Urgent Needs











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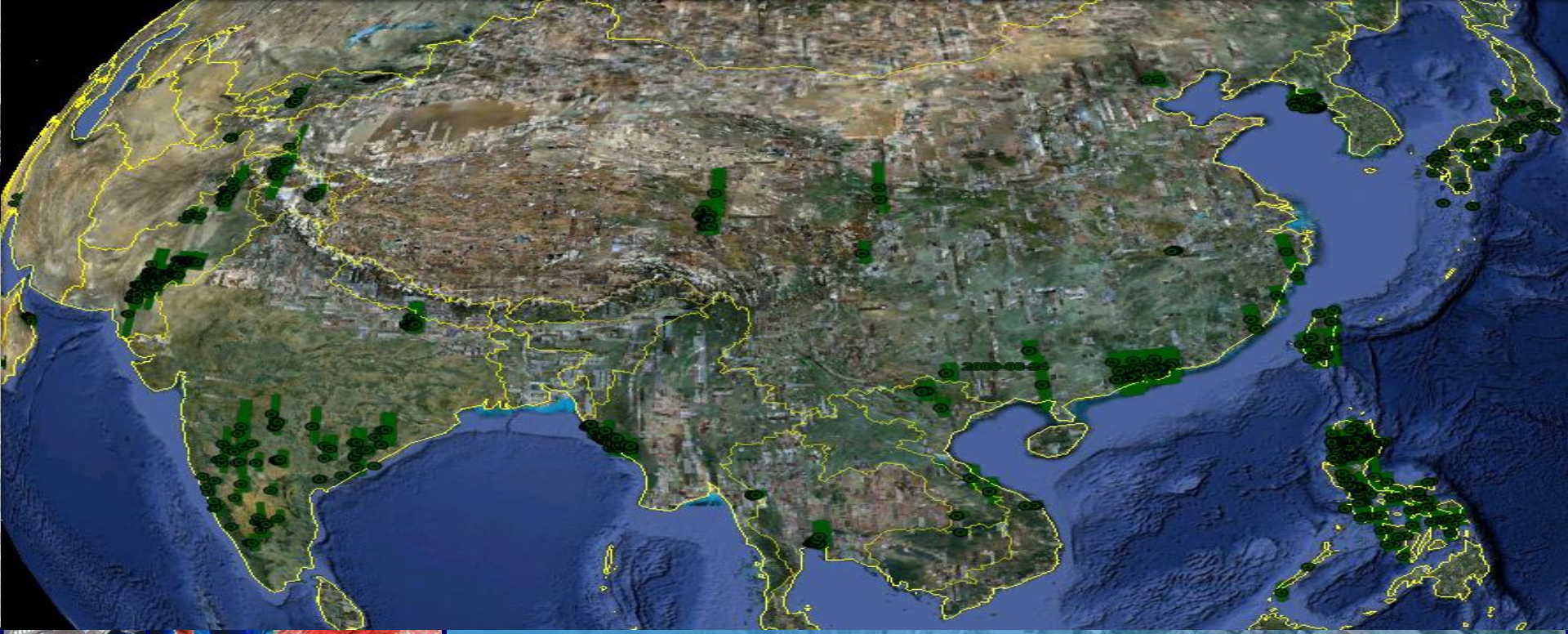
DG Monitoring Series—General Availability

Imagery Q1 2011	Information Q2 2011	Insight H2 2011
FirstLook	FirstWatch	FirstInsight
AssuredLook	AssuredWatch	AssuredInsight
	Diplomatic Facility Support Package	



DG FirstLook Crisis Event Service

January 2011

DIGITALGLOBE®

DG FirstLook Crisis Event Service

Major, sudden natural disasters and man-made events

- Earthquakes, fires, flooding, devastating weather
- Political unrest and demonstrations

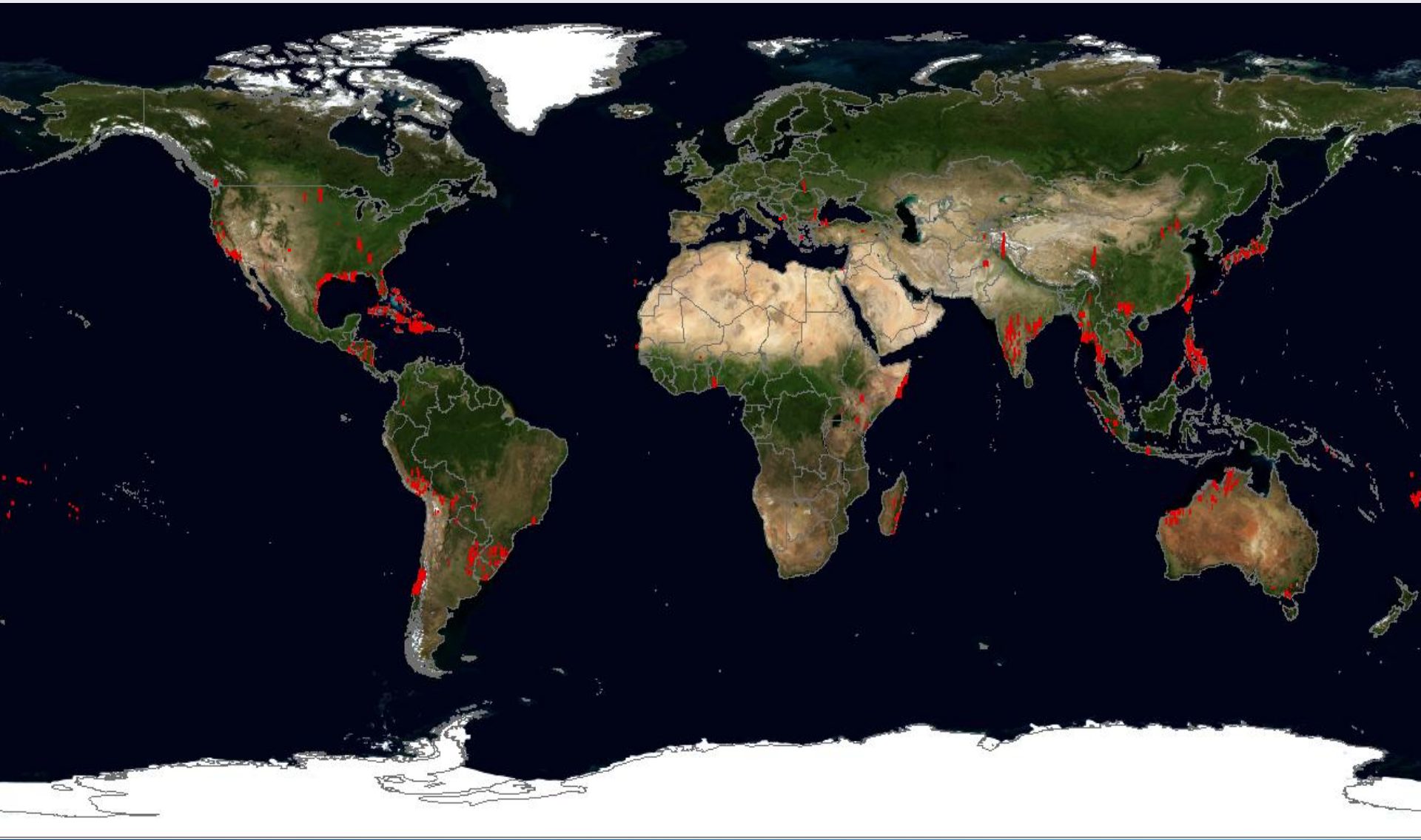
Responsive coverage includes:

- Pre- and post-event imagery of emerging events delivered within hours
- Best available imagery
  - Color, Pan and NIR* imagery
  - 50 and 60 cm + 15M Landsat
  - Over 3 million sq km available Online

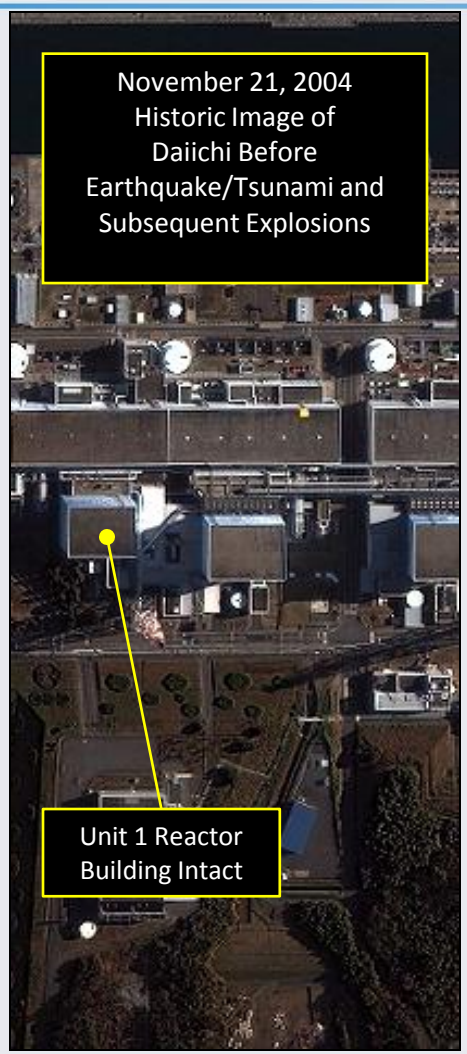
Access via DigitalGlobe Cloud Services

- OGC mapping applications
- Mobile devices

DG FirstLook Crisis Event Service
2010 Collections

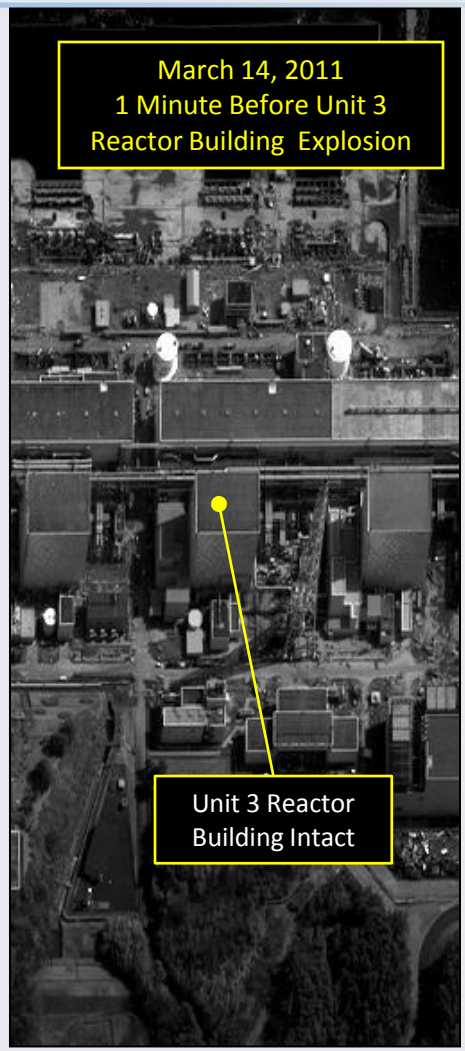


Fukushima Daiichi Nuclear Power Plant Facility
Okuma, Japan



DigitalGlobe's Natural Color Satellite Image
November 21, 2004

DigitalGlobe's Natural Color
Satellite Image
March 13, 2011 (00:52 GMT)



DigitalGlobe's Panchromatic
Satellite Image
March 14, 2011 (02:00 GMT)

DigitalGlobe's Natural Color
Satellite Image
March 14, 2011 (02:04 GMT)

Continuing Coverage of the Fourmile Canyon Wildfire

Boulder, Colorado

Burned Area

Burned Area

Sunshine Canyon Drive

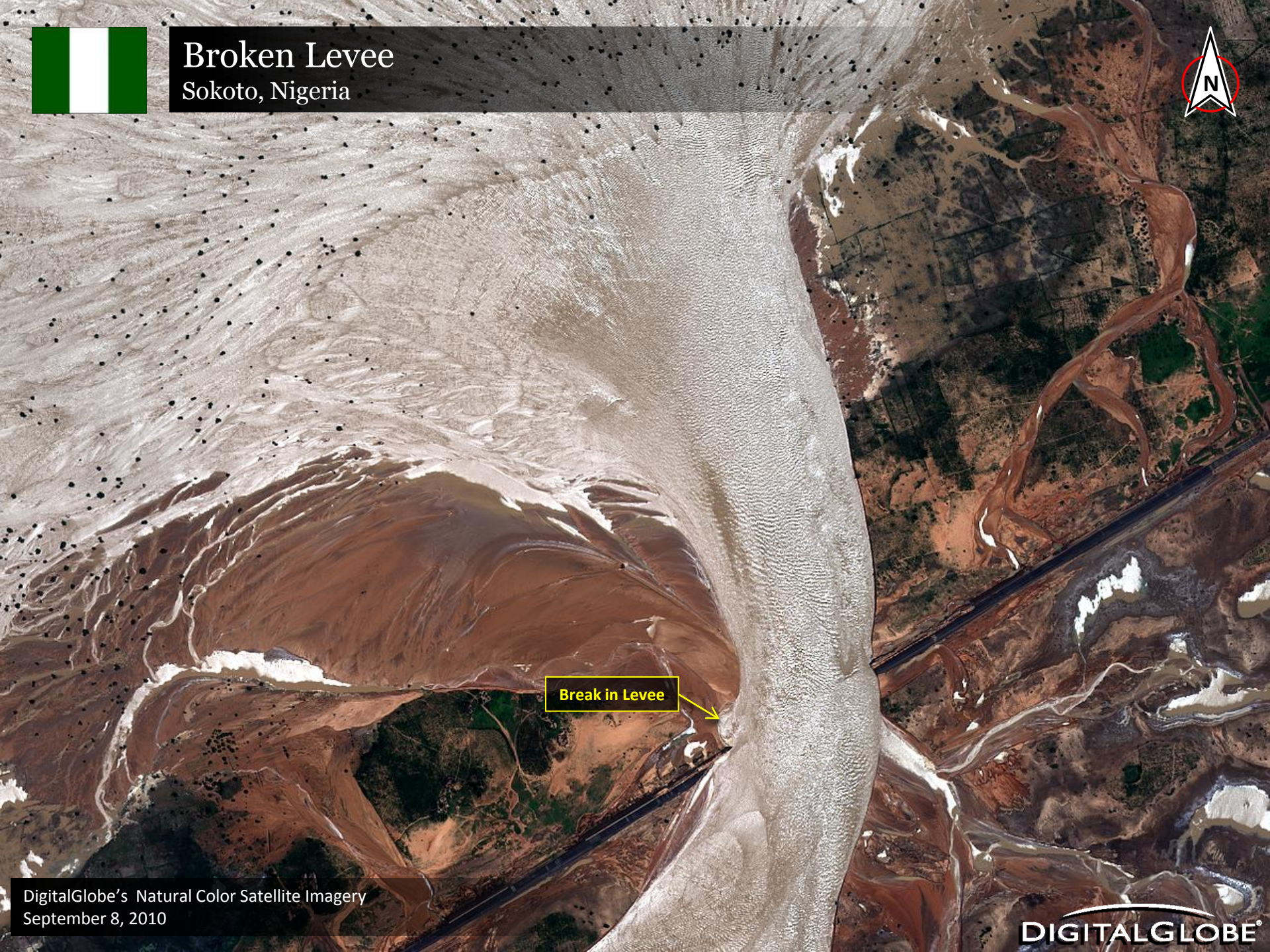
Fire Retardant ("slurry")

Fire Retardant ("slurry")

Photo: EPA/RICK GIASE

DigitalGlobe's Natural Color Satellite Imagery
September 10, 2010

DIGITALGLOBE®


Broken Levee
Sokoto, Nigeria
N
Break in Levee
DigitalGlobe's Natural Color Satellite Imagery
September 8, 2010
DIGITALGLOBE


Chemical Waste Reservoir (After Break)
Kolontar, Hungary
47 05 12 N 17 29 52 E
N
Break in Reservoir Wall
DigitalGlobe's Natural Color Imagery
October 8, 2010
DIGITALGLOBE

Chemical Waste Reservoir (After Break)

Kolontar, Hungary

47 05 12 N 17 29 52 E

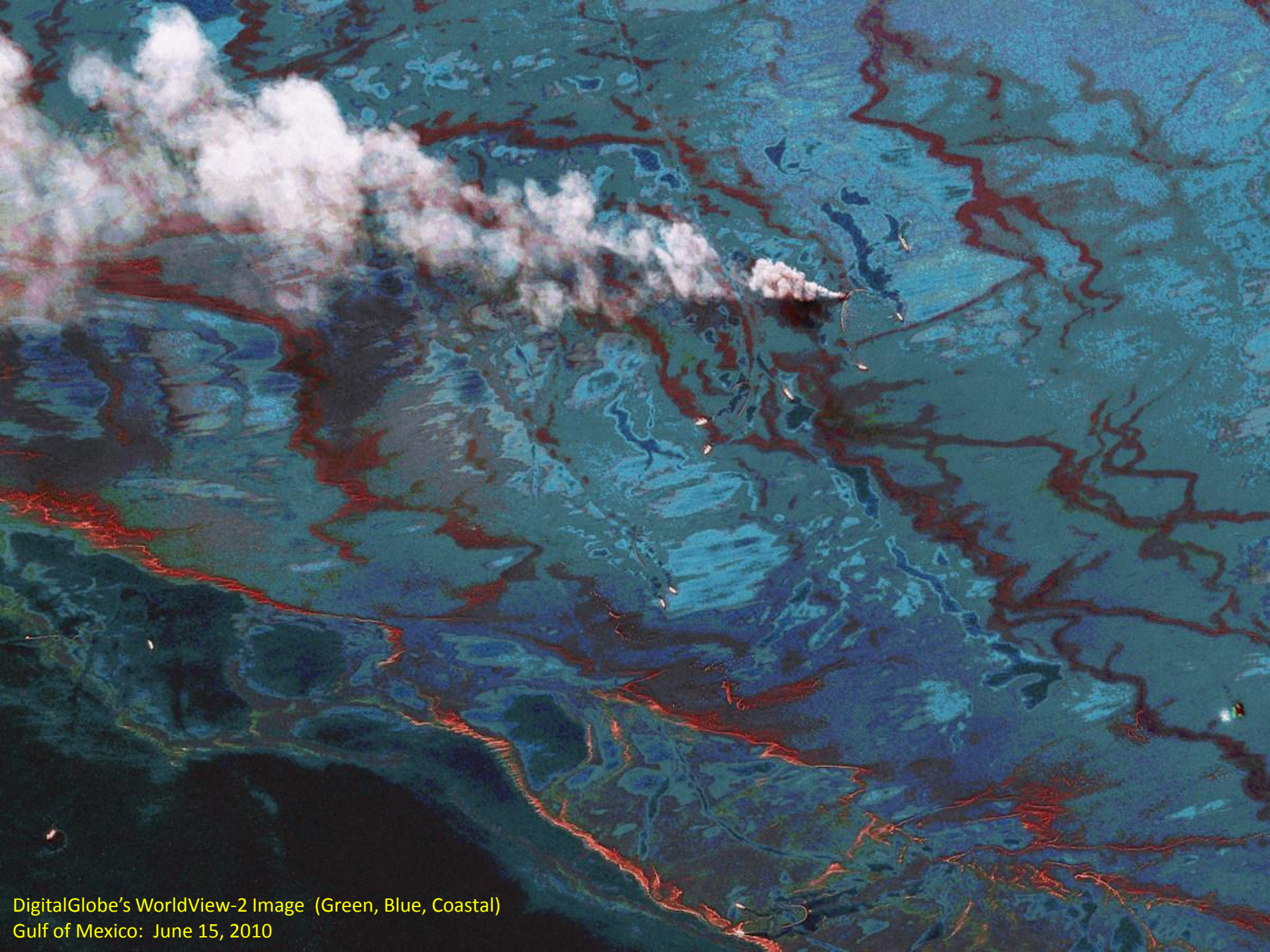
65 Meters Wide

(AP Photos/MTI, Gyoergy Varga)

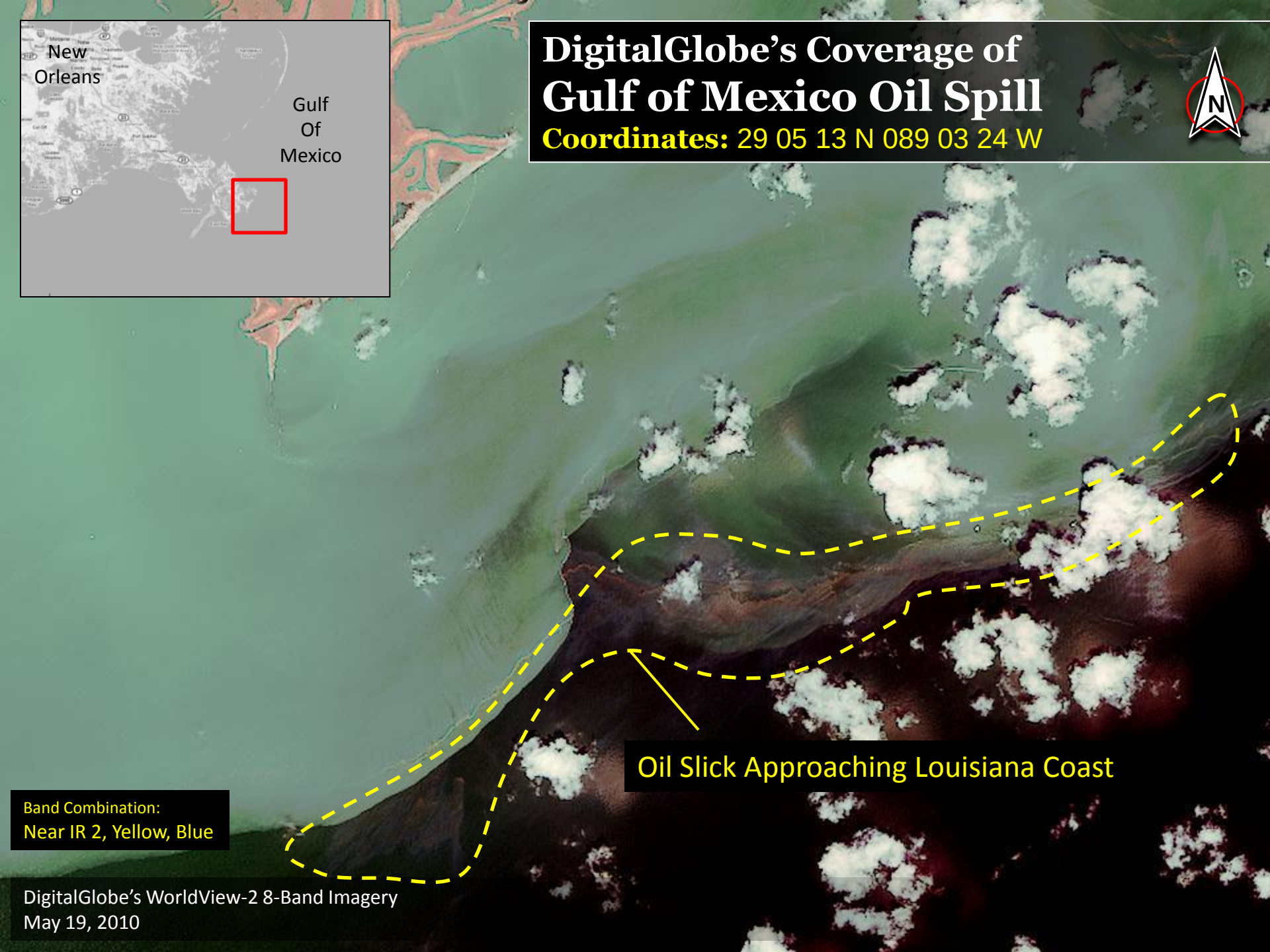
DigitalGlobe's Natural Color Imagery
October 8, 2010

DIGITALGLOBE


OIL SPILL
Gulf of Mexico
DIGITALGLOBE®



DigitalGlobe's WorldView-2 Image (Green, Blue, Coastal)
Gulf of Mexico: June 15, 2010


New Orleans
Gulf Of Mexico
DigitalGlobe's Coverage of
Gulf of Mexico Oil Spill
Coordinates: 29 05 13 N 089 03 24 W
N
Oil Slick Approaching Louisiana Coast
Band Combination:
Near IR 2, Yellow, Blue
DigitalGlobe's WorldView-2 8-Band Imagery
May 19, 2010

DigitalGlobe's Coverage of Gulf of Mexico Oil Spill

Coordinates: 26 06 45 N 089 06 29 W

Band Combination:
Red, Green, Blue

DigitalGlobe's WorldView-2 8-Band Imagery
May 19, 2010

DG AssuredLook

February 2011

DIGITALGLOBE®

DG AssuredLook

Tasking

- Site packs – repeat collection every 14 or 30 days
- 100 km^2 area

Processing

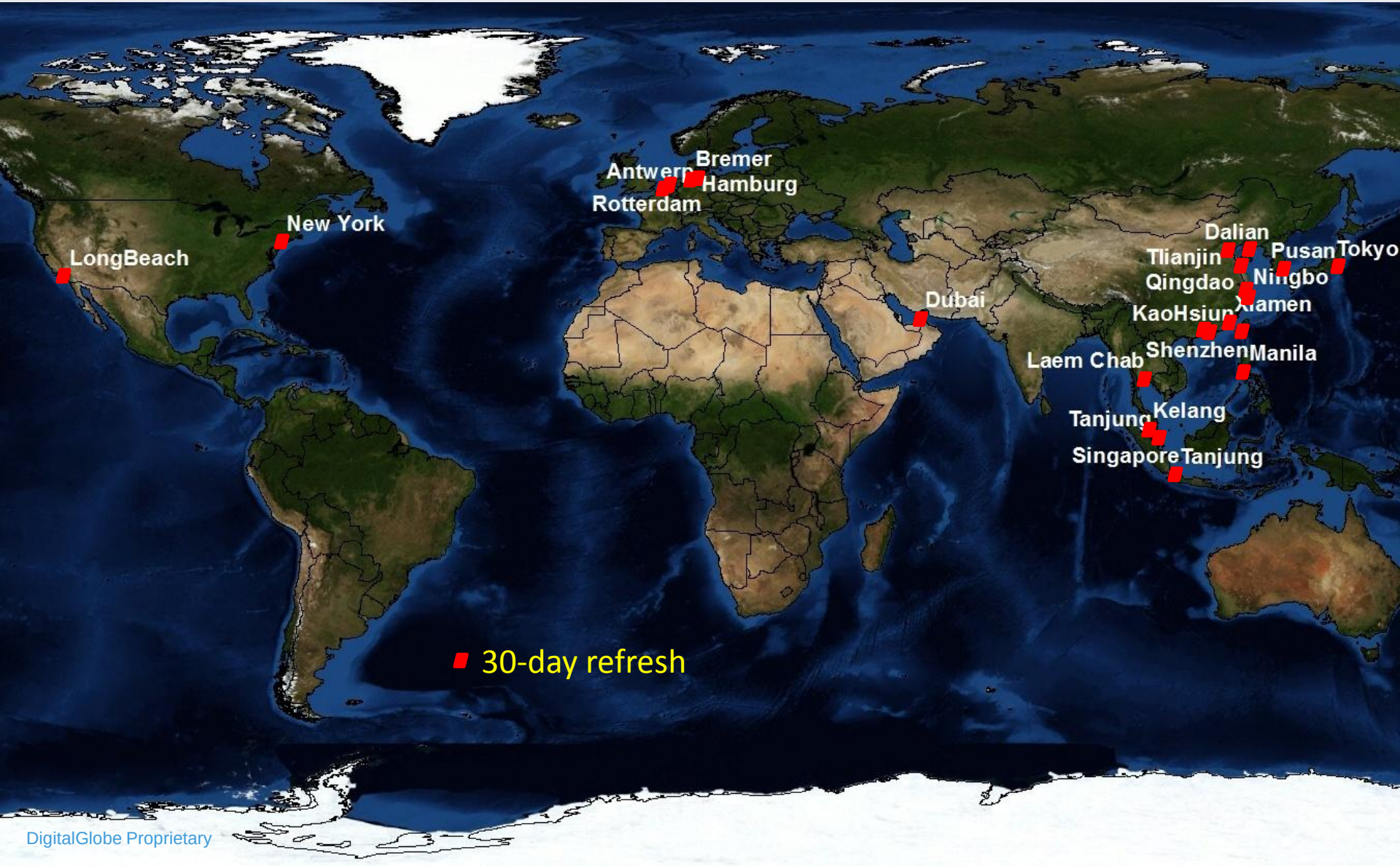
- Best available panchromatic, MS or pan-sharpened product
- Up to 1-meter resolution
- Standard imagery product--GeoTIFF

Delivery

- Assured delivery less than 12 hours from imaging
- FTP and online delivery
- 60-day withhold from ImageLibrary for collects resulting from program
  - “Bonus” collects associated with other tasking are delivered if data covers site pack areas
- No cloud cover limitations – all imagery delivered
- Email notification of production and delivery

Current DG AssuredLook Site Packs

DG AssuredLook
World Ports: Top 25



DG AssuredLook: World Ports--Top 25

North America

- ✓Los Angeles
- ✓New York City

Europe

- ✓Antwerpen
- ✓Bremerhaven
- ✓Hamburg
- ✓Rotterdam

Middle East

- ✓Dubai

Asia

- ✓Singapore
- ✓Dalian
- ✓Shanghai
- ✓Hong Kong
- ✓Shenzhen
- ✓Pusan
- ✓Guangzho
- ✓Kao-Hsiung Kang
- ✓Tianjin
- ✓Kelang
- ✓Tanjung Pelepas
- ✓Laem Chabang
- ✓Manila
- ✓Ningbo
- ✓Tanjungpriok
- ✓Tokyo
- ✓Qingdao Gang
- ✓Xiamen

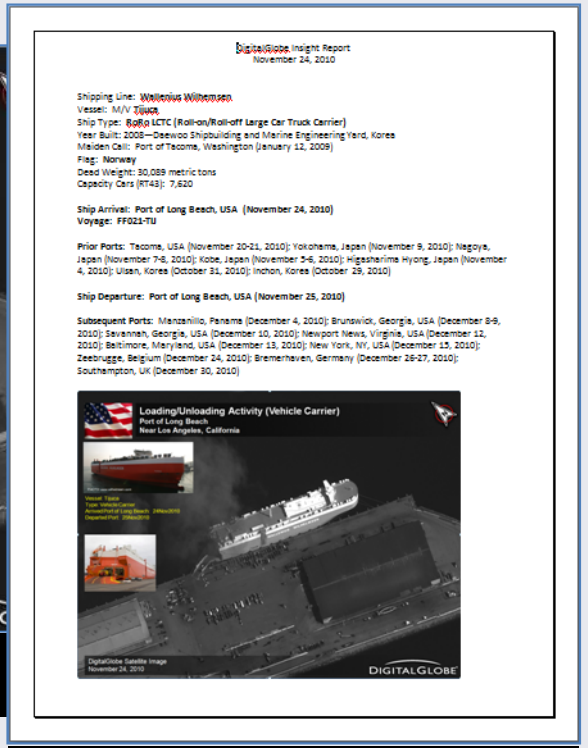
Assured Monitoring Series: World Ports
Los Angeles, California

From Imagery

AssuredLook

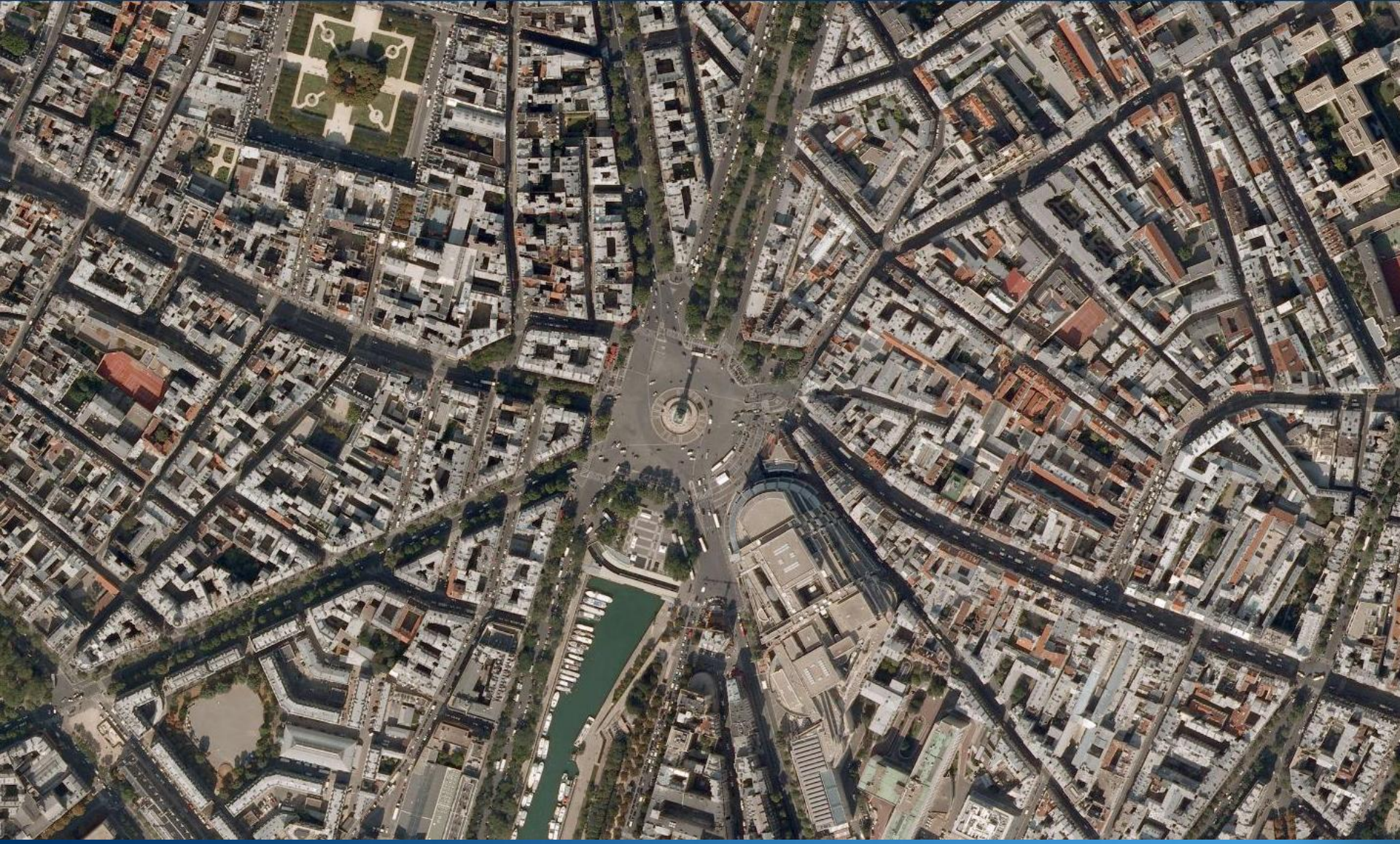
To Information

AssuredWatch



To Insight

AssuredInsight



Digitalglobe Cloud Services

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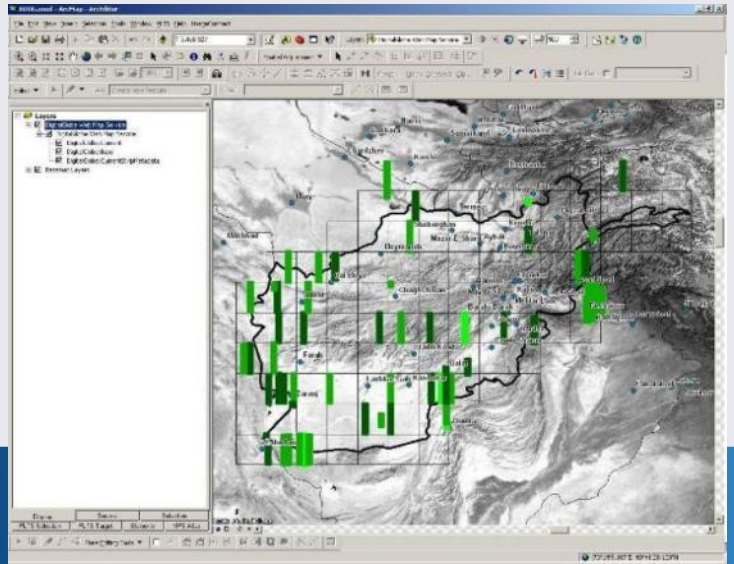
DG Cloud Services

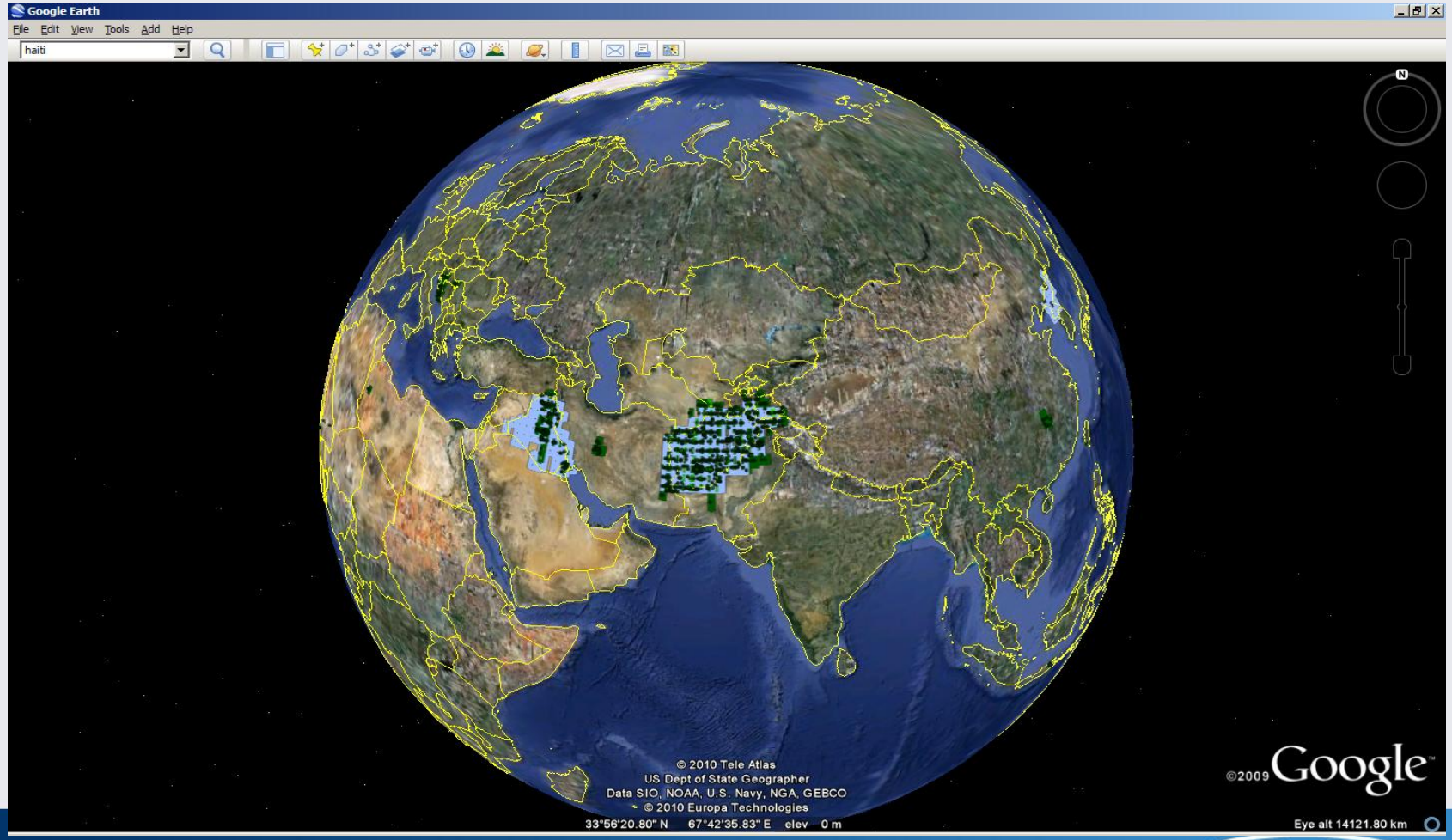
DGCS includes **Open Geospatial Consortium (OGC)** compliant web services providing on-demand access to near real-time map-ready imagery

- *Web Mapping Service (WMS) "View"*
- *Web Coverage Service (WCS) "Download"*
- *Web Feature Service (WFS) "Query & Filter"*
- *Web Mapping Tile Service (WMTS) "Speed & Performance"*
- *GeoRSS Feeds Available*



DG Cloud Services

Include cached and tiled content accessible via Google Earth and other Earth Service “Spinning Globe” Based Applications (ArcGlobe Explorer, NASA WorldWind etc.)



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DG Cloud Services Capabilities & Benefits

Capability	DG Cloud Services Benefits
Custom Image Delivery	•Imagery selected, formatted, projected, processed, stitched and delivered on demand, per user request
Rapid Image Delivery	•Improved performance with rapid rendering of cached pyramid tiles displayed on user request **(4 sec. average response time globally to transfer WMS 1024 .jpg)**
Metadata	•Robust coverage information and metadata enabling search & discovery – online shapefiles
Client Integration	•EarthService provides single-click access in Google Earth •ImageConnect provides rich, easy access in Arc
Notifications	•Email and RSS Alerts for new Cloud Service Imagery
Licensing Models	•Subscription •Per Image •Custom
Ingest	•Ingest in an hour

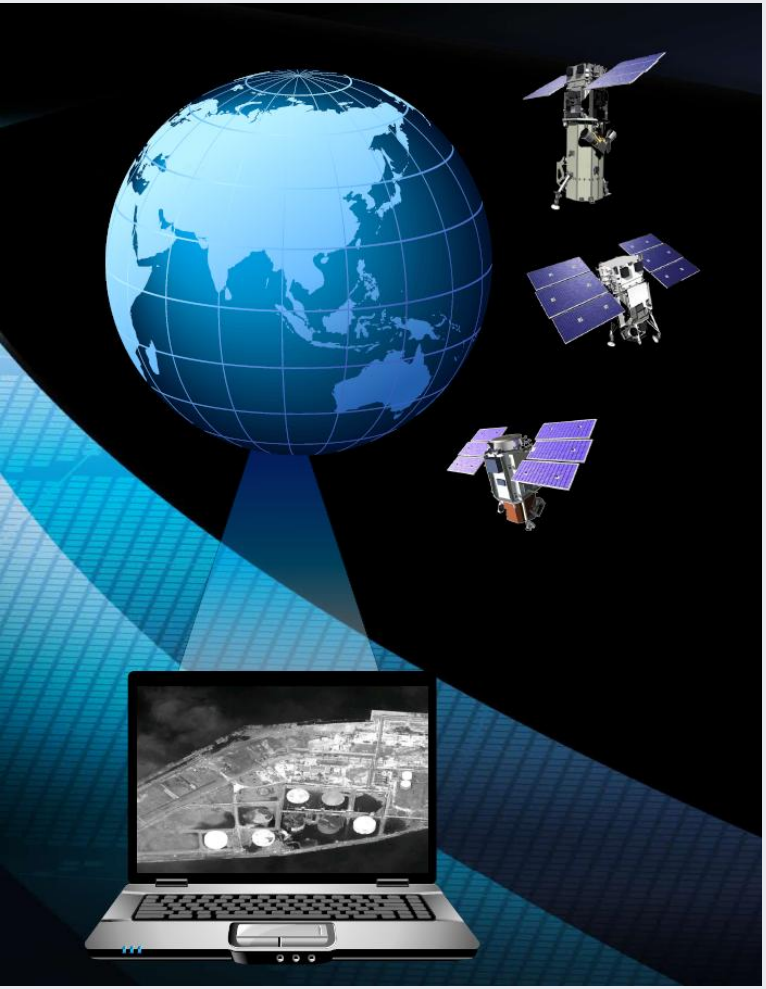
Initial DG Cloud Services Schedule

- January-March 2011: Global Beta Access
  - Limited customers (5-7)
  - Solicit feedback & gauge market response
- April 2011: General Availability
  - All online customers
  - Access to Global Basemap and DG Monitoring Products
- Point Releases each quarter
  - Online access to new Content Products
  - New Capabilities and Enhancements

DG Monitoring Series Summary

- FirstLook/CES & AssuredLook (AL) available today and delivering
- Standard pricing available
- Saves time
- Additional AL Site Packs and improved refresh in Q2 2011
- “AssuredWatch” updates in Q2 2011
- Adding “Insight” products in H2 2011

DG Portable Appliance Delivery Overview



Providing up to date image and analysis products in the field is a challenge…

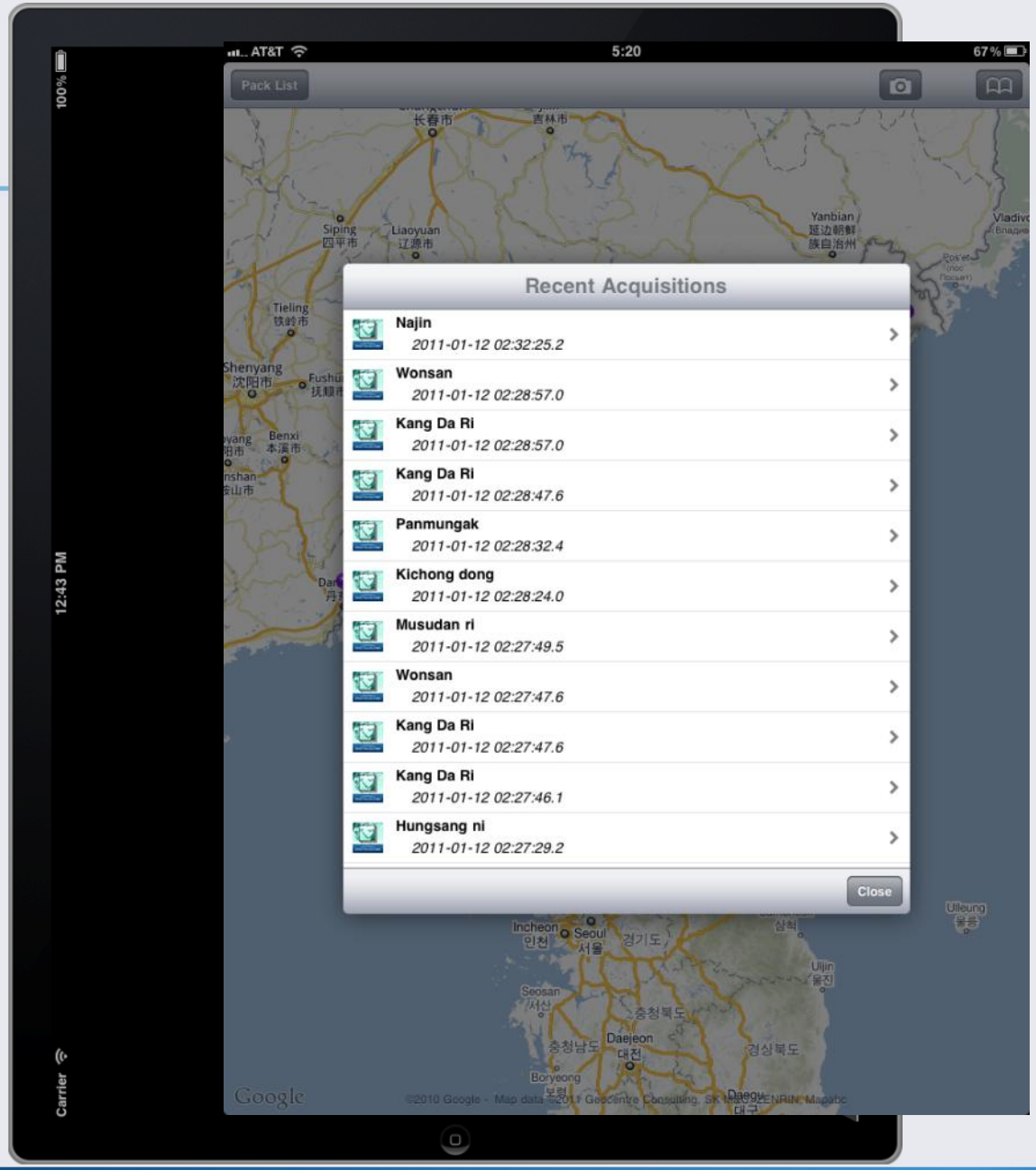
End users/responders face many obstacles:

- ***Limited network bandwidth***
- ***Limited access to imagery exploitation tools***
- ***Timely delivery of recent imagery***

DG Portable Appliance Overview

- *Portable and disconnected*
- *Turnkey self contained solution*
- *Ruggedized laptop or other mobile device delivery*

AssuredLook on IPad




AT&T
5:18
67 %
Yongbyon
2010-06-24 : 02:24:02 GMT
2011-01-03 : 02:46:07 GMT

DG Global Basemap

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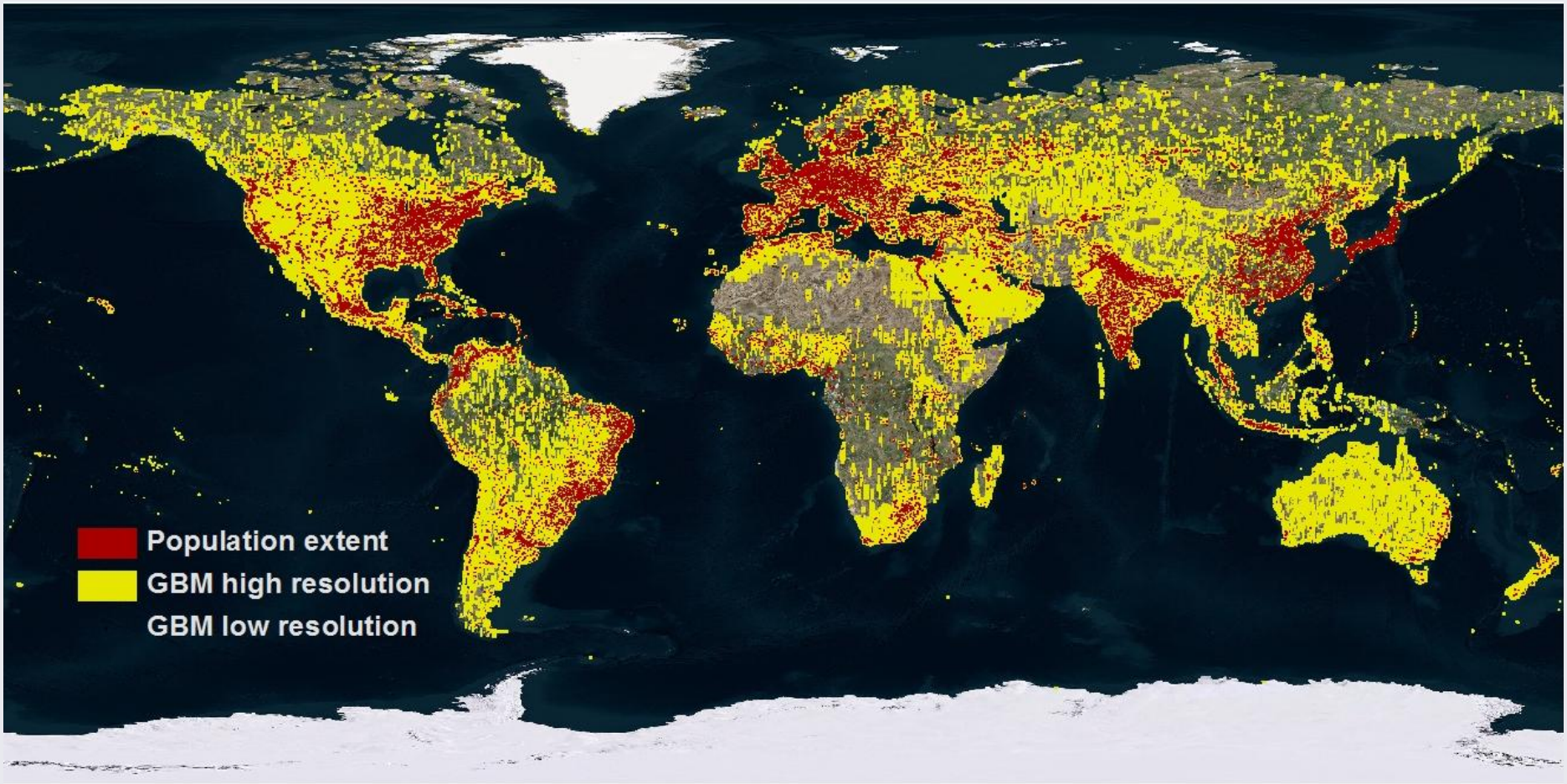
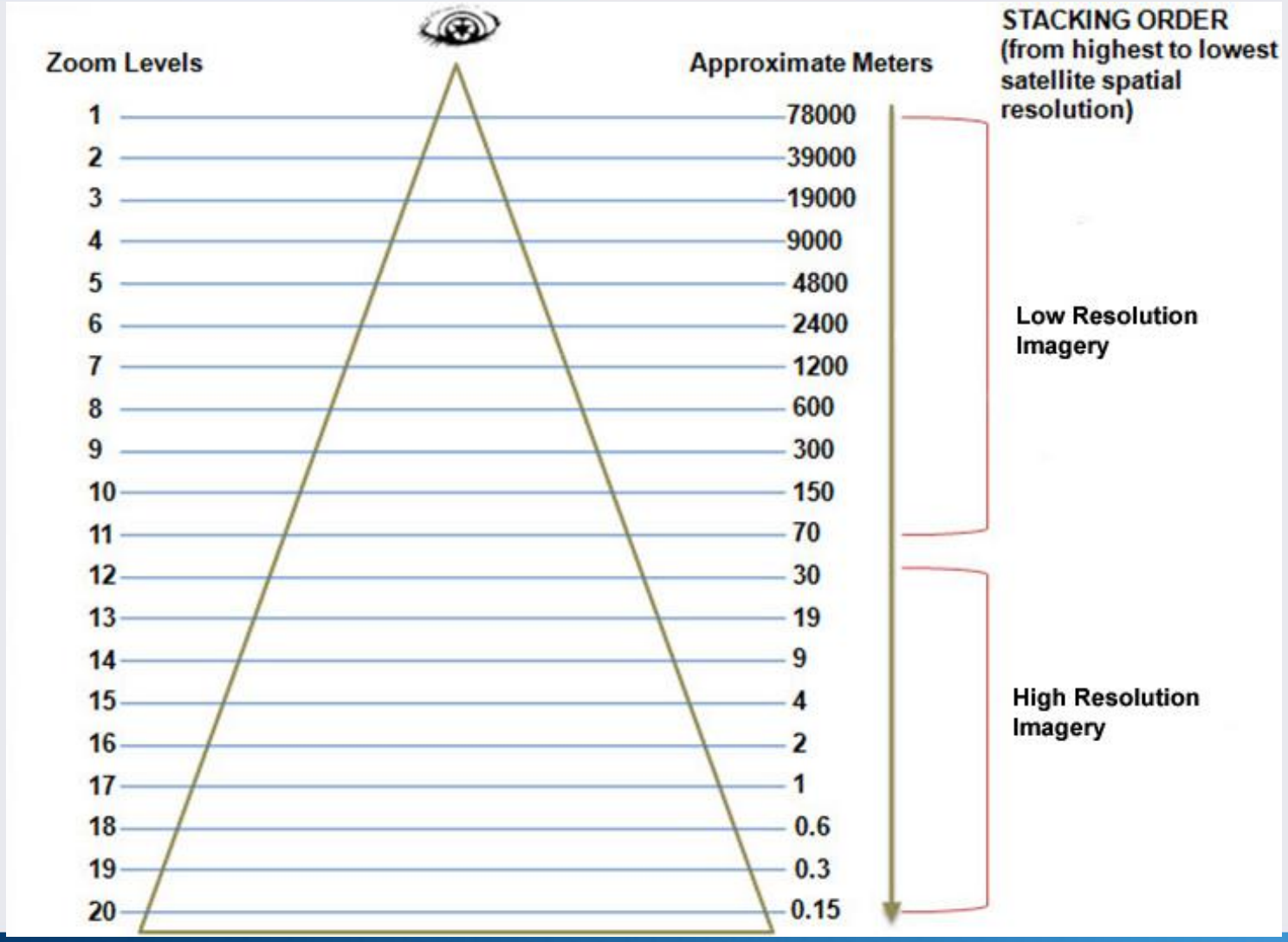
DG Global Basemap

Product Attribute	Global Basemap
Description	Fast & easy access to complete imagery coverage for any geographical need using aggregation of off-the-shelf Advanced Ortho products
Accessibility	• *Online* through DigitalGlobe Cloud Services • *Offline* JPEG tiles delivered on hard drive
Updates	Annual, bi-annual or quarterly

DG Global Basemap Coverage



DG Global Basemap Pyramid



Level 20 – 15cm

Low resolution (Landsat/MODIS)

DG High Resolution (aerial/satellite)

DIGITALGLOBE ADVANCED ORTHO AERIAL PROGRAM (AOAP) UPDATE

ADVANCED ORTHO SERIES
VISION PREMIUM – PRECISION AERIAL

March 2011

AOAP – DG/MSFT Partnership

DigitalGlobe Announces New Agreement with Microsoft for High-Resolution Aerial Imagery

DigitalGlobe to be the Exclusive Distributor of Microsoft UltraCamG 30-cm Aerial Imagery

Longmont, Colo., October 28, 2009 – DigitalGlobe (NYSE: DGI), a leading global provider of commercial high-resolution world-imagery products and services for defense and intelligence, civil government, and commercial customers, today announced it has signed an agreement with Microsoft Corp. (Nasdaq: MSFT) to launch the Clear30 program, an initiative to distribute high-resolution aerial imagery of contiguous landscapes, initially in the U.S. and Western Europe. These orthophoto mosaics will be available online through Bing Maps and offline through DigitalGlobe channels. DigitalGlobe will be the exclusive offline distributor.

DIGITALGLOBE®

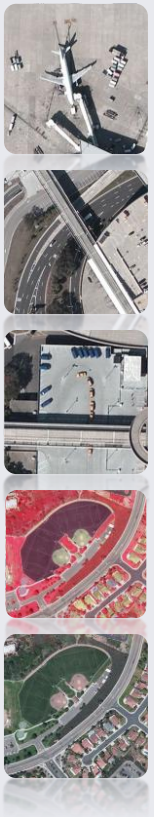
Microsoft®

VEXCEL IMAGING GmbH
a Microsoft company

UltraCamG Camera

AOAP Highlights

- **First and largest** country-wide/region-wide ortho at ***30cm resolution (Includes CONUS and Western Europe)***
- **Optimized on a single standard**
  - *Standard format, common platform, uniform resolution, single sensor,*
- **Standardized accuracy specifications**
  - *2.67m, 4.01m, 5.34m CE90*
- **Imagery is collected by 1deg x 1deg cell (~100km x ~100km) per day, per plane (~3861 mi^2 per 1 deg cell) – 10 operational aircraft**
- **DG is exclusive distributor of UltraCam G GeoTIFF imagery and derivative works**
- **MSFT will offer compressed version of AOAP on Bing**
- **Easy to procure**
  - *Off-the-shelf GeoTIFF availability Now for offline delivery*
  - *Online delivery via DG Cloud Services (1H 2011)*
  - *Meets U.S.Govt's requirements for reducing costs/efficiencies and taking advantage of economies of scale*



AOAP Coverage (cont.)

Largest Commercial Aerial Mapping Project in History

- Complete Coverage US (“Lower 48”)
- Western Europe
- Plus Metros: Fairbanks, Juneau, Anchorage (AK)
- 10,400,000 square km
- 238 terapixels
- ~1.2 petabytes raw imagery data
- 24 months initial acquisition
- Refresh 2012 through 2014 (6M km^2)
- Order of Magnitude efficiency improvements through software automation and custom sensor design

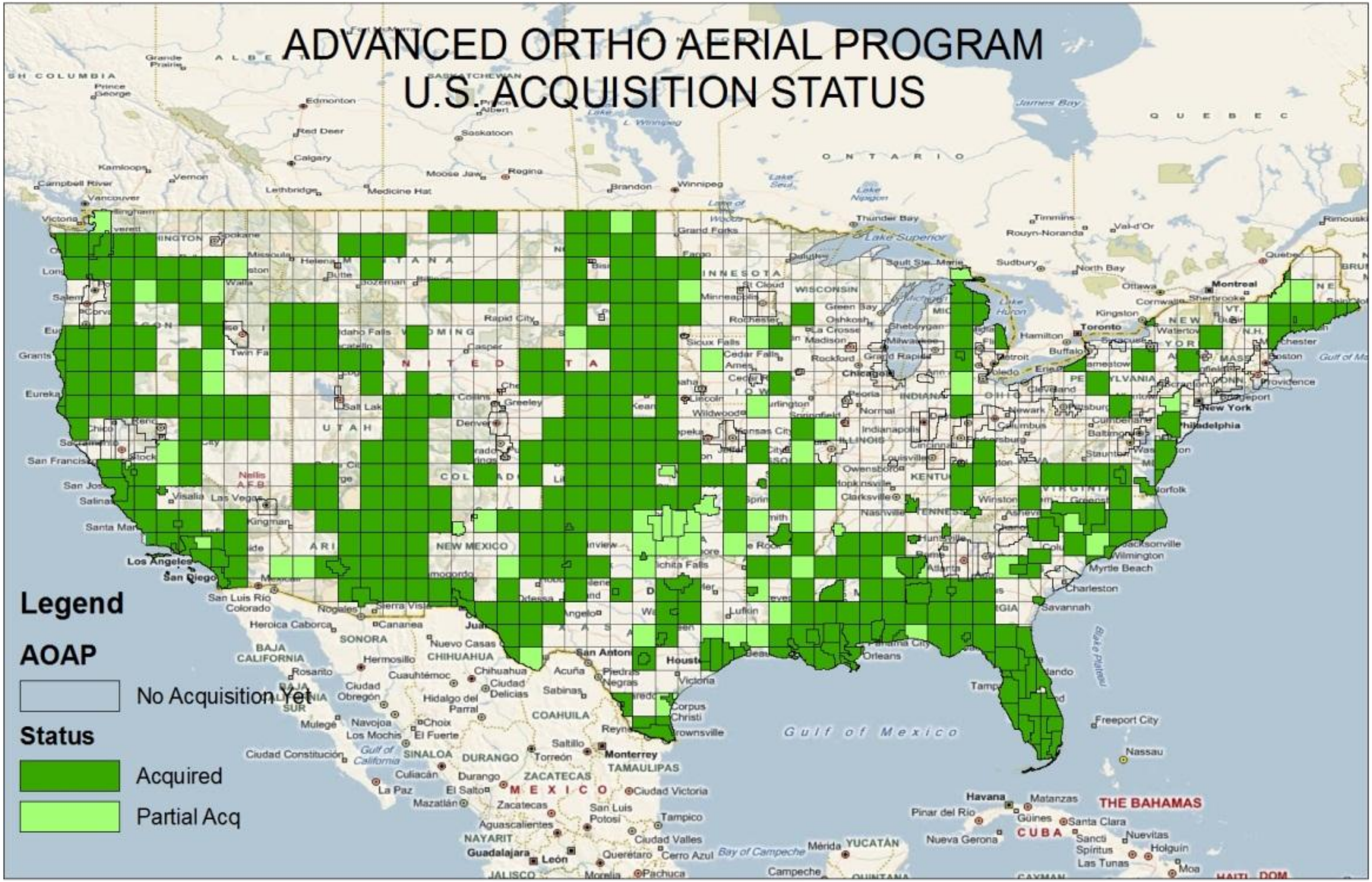
Acquisition Status as of Mar. 24, 2011

Region	Total Sq.Km.	Acquired Sq.Km.	Acquired %
U.S.	8,000,000	3,586,600	45%
Europe	2,400,000	226,200	9%
Total	10,400,000	3,812,800	37%

UltraCamG (Giant)

- Largest format aerial mapping camera
- 8 lenses, 14 CCDs, 28 HDDs
- Pan, color, IR
- Ortho, Elevation, Classification
- Exclusive to Clear 30 project

AOAP Collection Status - CONUS



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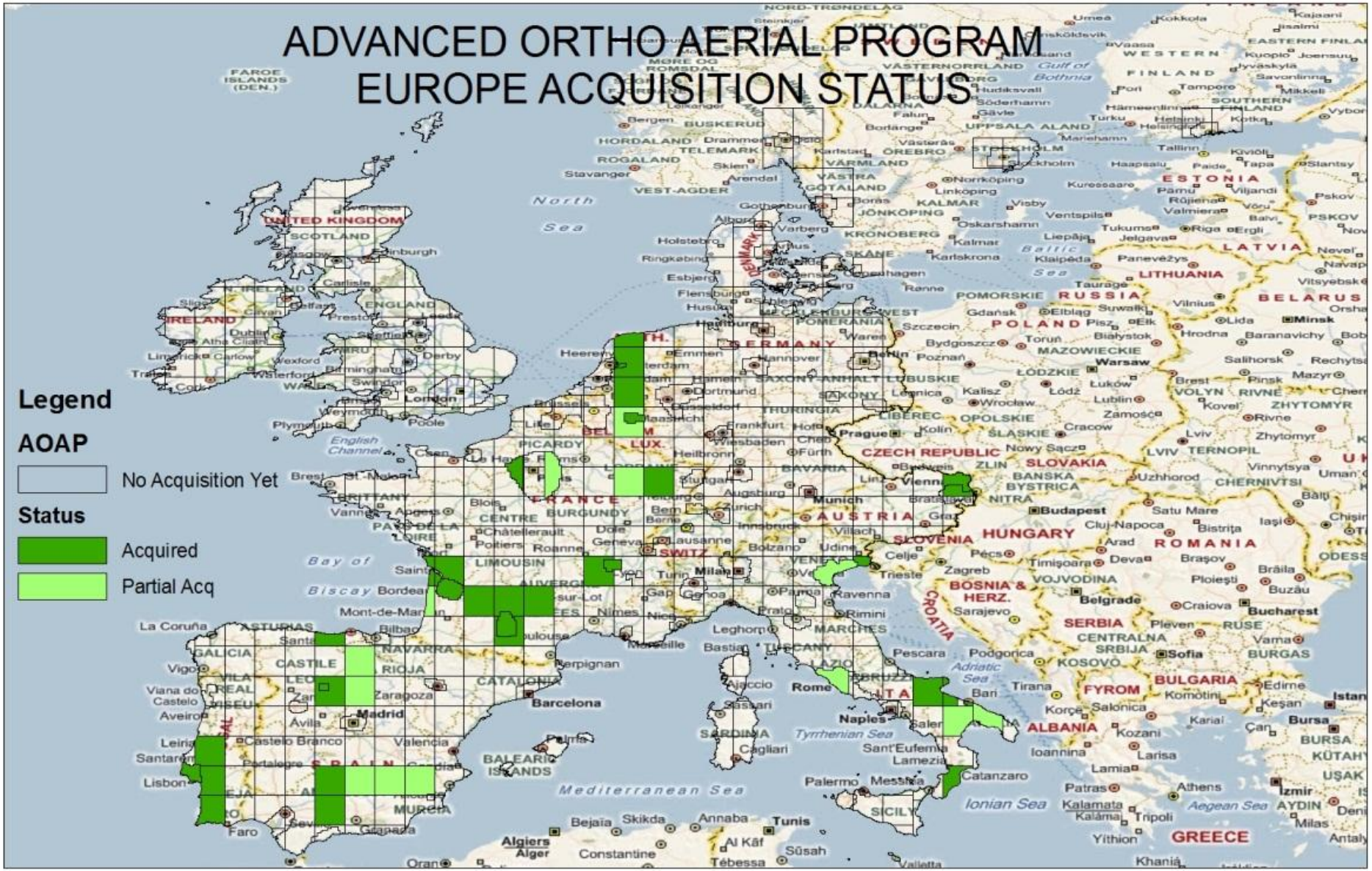
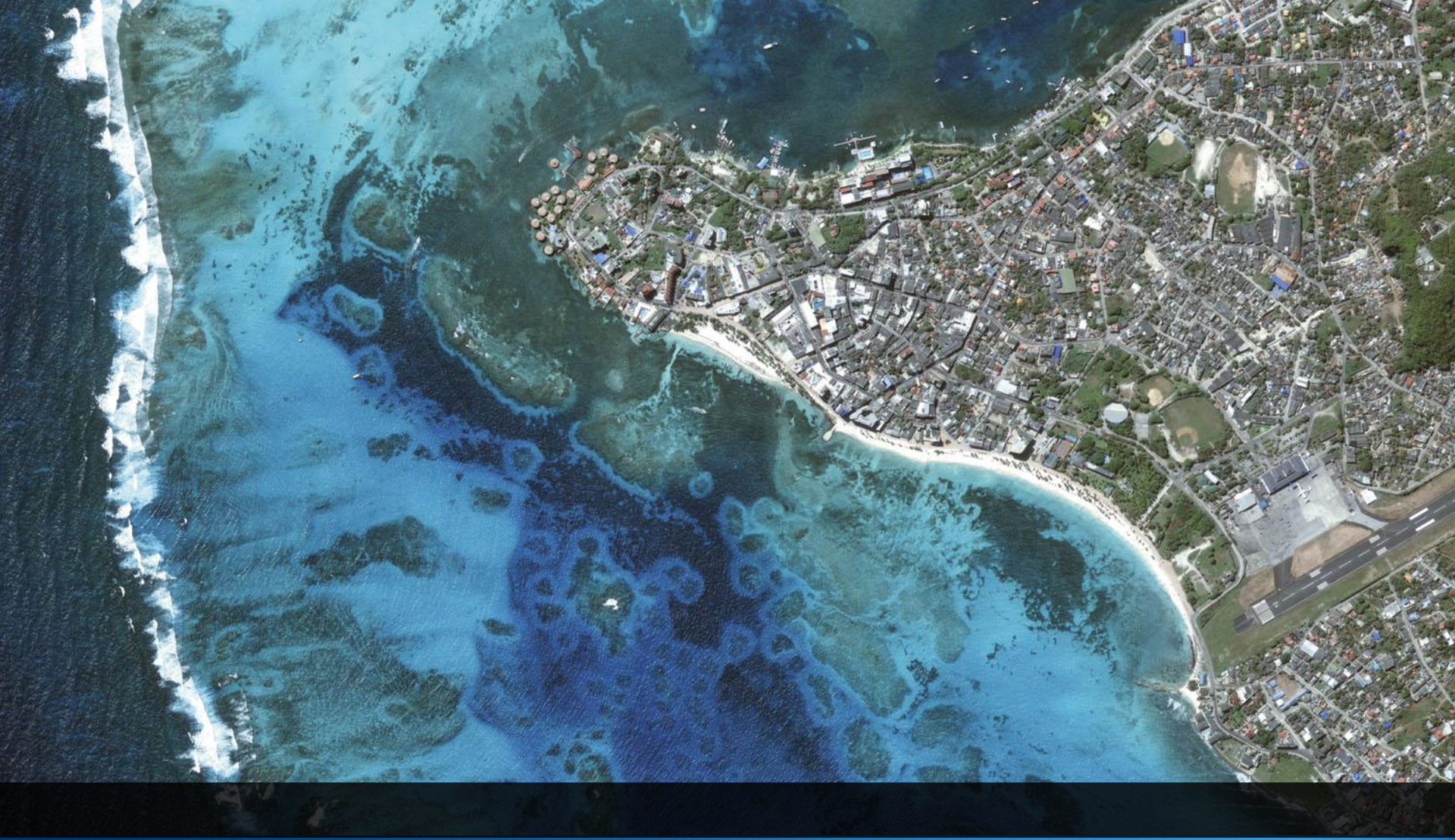
AOAP Collection Status – W. Europe



AOAP Collection/Product Specifications

Environmental Condition	High Value Areas	Standard Region Tiles	Remote Region Tiles	Remarks
Clouds	0	0	< 1%	
Cloud Shadows	0	< 2%	< 3%	Must not be black and detail is clearly visible
Haze	0	< 2%	< 3%	Must not be white and detail is clearly visible
Smoke (opaque)	0	0	< 1%	Detail is visible
Minimum Sun Angle	30^{o}	20^{o}	20^{o}	May be reviewed as necessary
Standing Water (flood, rain)	no	no	< 1%	
Snow and Ice	Permanent snow only	Above timber line	< 3%	Exceptions for Ski areas, etc. by review
Leaf-Off	Required in US	Desired in US	NA	Exceptions may be made by review

Imagery is collected by 1deg x 1deg cell (~100km x ~100km) per day, per plane (~3861 mi^2 per 1 deg cell)



AOAP Precision Aerial Samples

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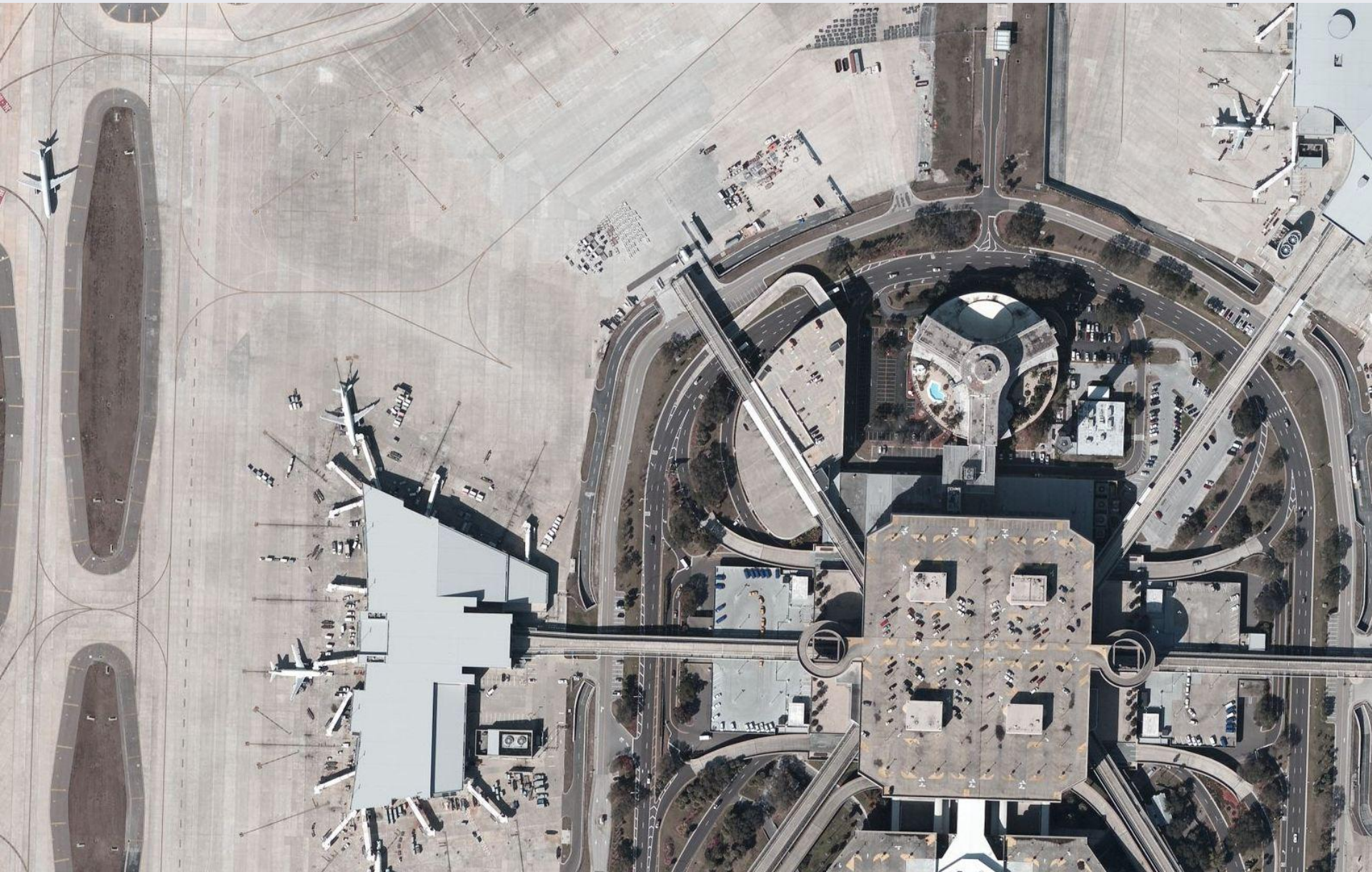
San Diego Image Samples

San Diego Image Samples

Tampa Image Samples

Tampa Image Samples

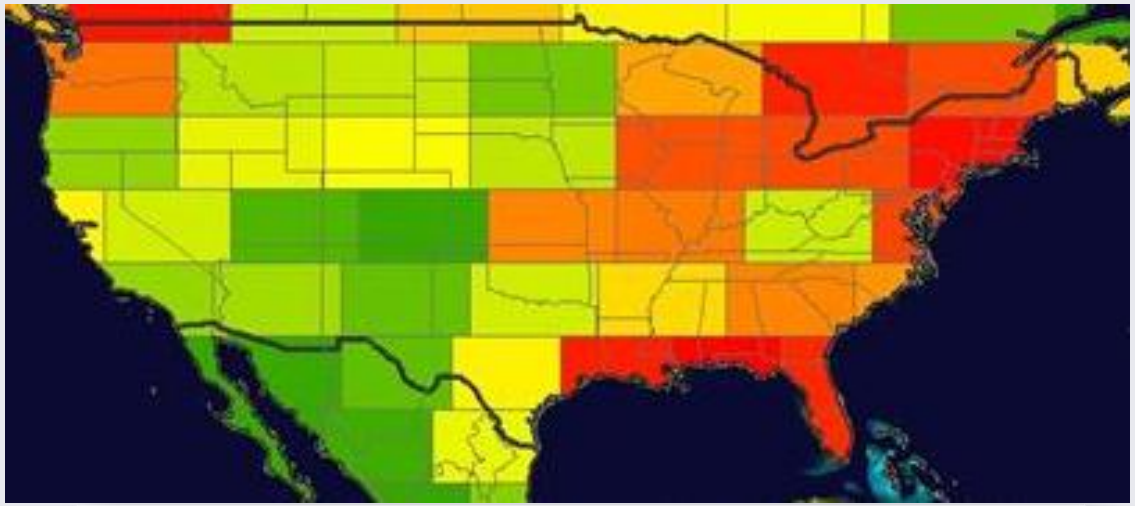
Tampa Image Samples



Tampa Image Samples

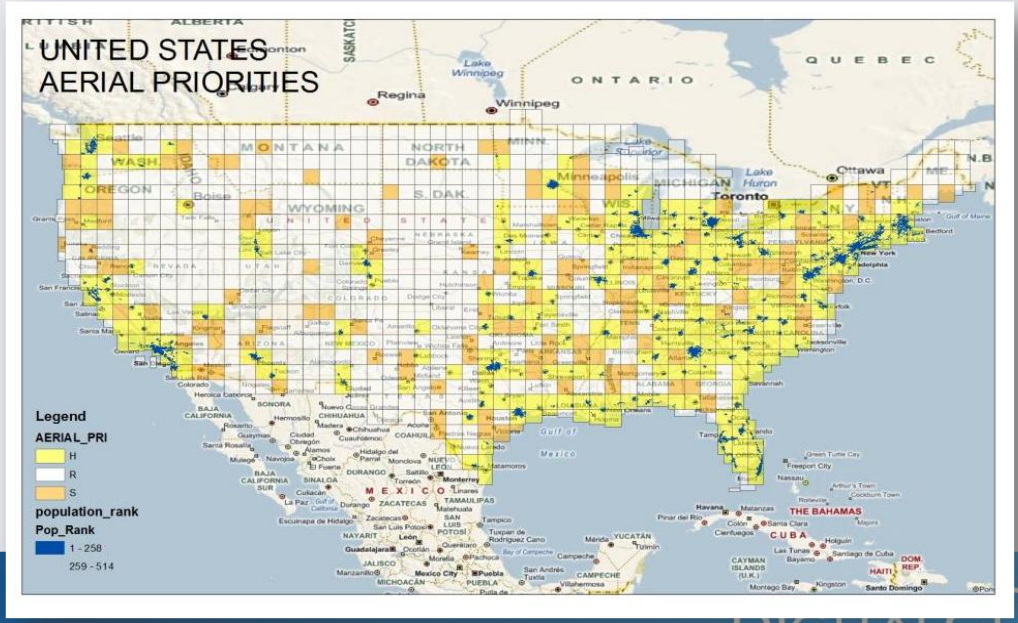
Complementary DG Satellite and Aerial Acquisition Balance of WV-2 and Aerial

Heat Map for WV-2
(from IFTN RFI Response)



GeoCell/Block Priorities for Clear30

(White Cells are “Rural” – lowest priority)



Summary

- **The Strength of DG's Constellation**
  - World's largest constellation of sub-meter unclassified satellite imagery
  - Enables frequent access and revisit
- **Largest Imagery Archive**
  - Most complete historical archive of high-resolution satellite imagery
  - AOAP CONUS and WE (1-foot color orthoimagery)
  - Enables detailed change analysis
- **WV2 (and WV3) 8-Band Data**
  - Unique multispectral capabilities on WV2 (and WV3 in 2014)
  - Enables deeper analysis—bathymetry, intelligence, environmental apps
- **Web Services and Tailored Delivery Options**
  - Industry pioneer in providing multiple online and offline imagery and analytical solutions through DG Cloud Services
  - Enables value added products and services on line to wide variety of customer segments
- **Deep Domain Experience—DG and Partners**
  - DG imagery and geospatial experts on staff
  - Non-proprietary approach: Recognizes strength in partnering

For Additional Information:

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